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IMPROVEMENT AND RECOVERY RATES IN DEMENTIA PRAECOX WITHOUT INSULIN THERAPY

BY DUNCAN WHITEHEAD, M. D.,
UTICA, N. Y.

The institution of Sakel's hypoglycemic therapy in the treatment of dementia præcox has raised many questions. New phenomena have been brought to the attention of students in many branches of biological science, most importantly to the psychiatrist, the physiologist, the pathologist and the neurologist. To the psychiatrist engaged in clinical work and actively rubbing elbows with the world the ever present question is that of results. So far, the published results obtained from hypoglycemia therapy have been gratifying. The American figures have not been as encouraging as those reported from European centers—with the notable exception of Poland where results have been poor.[1] But they are generally taken to be better than those obtained from other forms of therapy. However, the question of results cannot be settled by a mere statement of figures obtained from hypoglycemic therapy. It must go further and include a comparison of these results with those obtained from other forms of therapy, or from those favorable features inherent in the natural history of the illness—that is, any tendency to spontaneous remission.

Through the recent history of psychiatry one is impressed by the large number of therapeutic procedures which have been tried in dementia præcox. One is equally impressed by the fact that most of them have been abandoned after brief trials. Since comparative statistical studies appear to be lacking, it must be concluded that they were abandoned because they failed to produce results more favorable than did the regular routines of institutional care. Yet when one attempts to find accurate and definite statements concerning the results of routine institutional care with which to make comparison, none seem to be available. The figures contained in hospital reports do not give an accurate picture since these figures are gathered by fiscal years or in relation to hospital population and do not consider individual cases. A consideration

of individual cases in sufficiently large series is, after all, the only sound means of arriving at a reliable conclusion.

Those statements found in the literature vary from Kraepelin's "lasting and really complete cures of dementia præcox, though they may occur, still in any case are rarities."[2] to Wilson's statement of consensus, "the usually recognized 25 to 30 per cent of spontaneous remissions."[3]

It was in an attempt to establish a working basis for the study of comparative results at the Utica State Hospital that the writer surveyed the records of 90 consecutive admissions to that hospital diagnosed dementia præcox.[4] The admissions are in the fiscal year 1935-36 and the survey was made in January, 1937, allowing from 6 to 18 months treatment, observation and followup of each case. None was treated by insulin.

The results showed that of these 90 cases, 9 per cent showed recovery, 7 per cent much improvement, 20 per cent improvement and 62 per cent no improvement. Classification as to duration of the psychosis revealed the following:

Under 6 months: improvement in 50 per cent, with 22 per cent recoveries.

From 6 to 18 months: improvement in 38 per cent, with no recoveries.

Over 18 months: improvement in 23 per cent, with no recoveries.

These results were in general one-half as satisfactory as the published European results with insulin so far as improvement was concerned.

Since dementia præcox is regarded as a chronic form of mental illness and since six months becomes therefore a comparatively short period of observation and treatment, another survey has been made. This study covers 105 consecutive admissions diagnosed dementia præcox during the fiscal year 1931-2, thus allowing a minimum observation period of five and one-half years. None was treated with insulin.

Of the 105 cases, the diagnosis was changed in three, leaving 102 cases to be considered. The present status of these was found to be:

	Number	Per cent
In hospital	41	40
Transferred	9	
Deported	3	
Died	6	6
On parole	1	
Discharged	42	41

In approximately five years, therefore, 6 per cent of the cases have died and 42 per cent have been returned to the community, leaving 52 per cent in this or other hospitals.

The therapeutic results were computed by using for those patients discharged the official condition on discharge as given in the case record, and for those in the hospital an estimate of present condition compared with that on admission. All were tabulated under the official designations used in the New York State Department of Mental Hygiene. Taking dementia præcox as a whole the following figures were obtained:

	Per cent
Recovered	2
Much improved	27
Improved	22
Unimproved	49

Grouping those recovered, much improved and improved, it appears that 51 per cent had shown improvement as against 49 per cent who were unimproved.

Taking the duration of the psychosis into consideration, there was found:

Under 6 months duration: improvement in 61 per cent, with 5 per cent of these recoveries.

From 6 months to 2 years: improvement in 61 per cent with no recoveries.

Over 2 years duration: 30 per cent improvement with no recoveries.

In the group of cases diagnosed hebephrenic, 64 in all, the improvement rate was found to be 51.5 per cent with 1.5 per cent recovery, 21.8 per cent much improvement and 28.2 per cent improvement. In the paranoid cases, 31 in number, the total improvement rate was 48.2 per cent with no recoveries, 35.5 per cent much improvement and 12.8 per cent improvement. The cases of

simple and catatonic type were too few to permit satisfactory conclusions.

As a further means of checking the comparative efficacy of hypoglycemic therapy the average duration of hospital residence (exclusive of parole) was determined for each type of result and was found to be:

Recovered: too few for statistical consideration.

Much improved: 9.4 months (ranging from 1 month, to 2 years and 9 months).

Improved: 30.9 months (ranging from 1 month to 5½ years).

Exacerbation of symptoms necessitating readmission to the hospital among those discharged was found to occur in nine, or 21 per cent, of the 42 discharged cases. Five of these were from the much improved and four from the improved groups. Of these nine who were readmitted only two remain in the hospital, the other seven having been discharged again.

In comparing these results with those obtained from insulin therapy, there are at least three factors which must be given consideration. Of primary importance is the consideration of diagnostic criteria. These are known to vary from center to center or, as Wilson has expressed it, "Schizophrenia is not a clear-cut disease —around a focus of indisputably recognizable cases there is a sphere in which diagnosis is a matter of opinion."[5] Another important consideration is that similar criteria in the evaluation of results should be used; a recovery should be called a recovery whether insulin is used or not. A third is that similar descriptive terminology should be used in classifying. For these reasons, a table recently compiled by Malzberg[6] has been used. It covers the outcome of insulin treatment of dementia præcox patients in New York civil State hospitals during 1937, and appears in this issue.

In tabular form the comparative results are:

	1-year survey Per cent	5-year survey Per cent	Insulin cases
Recovered	9	2	12.9
Much improved	7	27	27.1
Improved	20	22	25.3
Total	36	51	65.3
Unimproved	62	43	33.4
Died	2	6	1.3

In making this comparison it must be remembered that the writer's cases included in both surveys are not selected but rather taken as a series of consecutive admissions.

Conclusions

1. A survey of 105 consecutive cases of dementia præcox five years after admission shows 51 per cent to be improved; of these 27 per cent were much improved and 2 per cent recovered.

2. These results were more favorable than those of a similar series of cases surveyed after one year of observation and treatment. In the latter 69 per cent were found to be unimproved, compared with 49 per cent in the five-year survey.

3. If the illness had been in progress less than two years, the results were found to be twice as favorable as those in which the duration was over two years.

4. The average residence in the hospital of cases classified as much improved was 9.4 months. It was 30.9 months for those classified as improved.

5. Readmission to the hospital because of return or exacerbation of symptoms was required in nine cases, or 21 per cent of those discharged.

6. Comparison with results achieved by routine institutional measures, plus insulin therapy, shows a marked increase in the recovery rate and a marked diminution in the percentage of unimproved cases in the series treated with insulin. The percentage of improved and much improved cases is virtually the same with or without insulin.

REFERENCES

1. Cited from Yearbook of Neurology, Psychiatry and Endocrinology. Edited by Reese, Paskind and Sevringhaus. The Year Book Publishers, Chicago, 1937, pp. 393-395.

2. Kraepelin, E.: Dementia Præcox and Paraphrenia. Trans. by R. M. Barclay, edited by G. W. Robertson. E. S. Livingstone, Edinburgh, 1919, p. 188.

3. Wilson, I. G. H.: A Study of Hypoglycemic Shock Treatment in Schizophrenia. His Majesty's Printing Office, London, 1937, p. 7.

4. Whitehead, Duncan: Prognosis in dementia præcox. Psychiat. Quart. 11:3, 383-390, July, 1937.

5. Wilson, I. G. H.: Loc. cit.

6. Malzberg, B.: Outcome of insulin treatment of one thousand patients with dementia præcox. Appears in the present issue of the Psychiatric Quarterly.

"SPONTANEOUS" REMISSIONS IN DEMENTIA PRAECOX

BY ROBERT C. HUNT, M. D., HAROLD FELDMAN, M. D.,
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Although psychiatrists have been talking and writing confidently about the prognosis in dementia præcox for thirty years and more, there have been amazingly few sound statistical studies on the subject. The history of our attitudes toward the prognosis presents some rather strange paradoxes. As early as the second edition of his lectures, Kraepelin[1] said that improvements equivalent to cures were not unsual. By 1899[2] he was reporting a definite percentage of remissions, and this was only two years after he grouped Kahlbaum's catatonia, Hecker's hebephrenia, and dementia paranoides under the one term, dementia præcox (according to Hecht[3]). Since then there has been a steady stream of reports of individual cases or of small groups who have recovered. Yet there has been a persistent tendency to regard the condition as hopeless, and to hedge on the diagnosis when a case recovers.

With all the discussion and difference of opinion now current over the newer methods of shock therapy, it has become imperative that an adequate base line of results without these therapies be established. The literature alone falls rather short of meeting this purpose. There has been ample demonstration of general trends. Tables 1 and 2 show recovery and amelioration rates for dementia præcox in general as reported by various authors. Although there are considerable discrepancies between individual reports, the averages arrived at by combining the figures are probably not far from the true rates in series of unselected cases. There have been a few scattered reports of prognosis in groups divided as to type of psychosis, whether catatonic, paranoid, or hebephrenic, and these reports will be referred to later.

These reports are for the most part inadequate, nor have there been adequate reports about the outcome in special groups selected according to age, physical condition and duration of psychosis before admission, as the cases are selected for the newer therapies.

The present study represents an attempt to fill in some of these gaps in our knowledge.

TABLE 1. RECOVERY RATES, FROM THE LITERATURE

Author	Number of cases	Number recovered	Per cent recovered
Stearns[4]	395	51	13
Rosanoff[5]	213	25	11
Ebwinger (quoted by de Almida[6])	?	?	22
Bond[7]	20	0	0
Bond[8]	34	3	8.8
Pollock[9]	19,927	?	6.4*
Strecker and Willey[10]	186	38	20.4
Levin[11]	592	35	5.9
Wootton et al[12]	95	18	20
Whitehead[13]	90	14	15.5
Bond and Braceland[14]	116	12	10.3
Total (excludes the figures of Ebwinger and of Pollock)	1,741	196	11.3

*Number discharged as recovered per 100 admissions during the same period.

TABLE 2. AMELIORATION RATES, FROM THE LITERATURE

Author	Number of cases	Number ameliorated	Per cent, ameliorated
Pfersdorff (quoted by Kraepelin[15])	150	23	15
Coles and Fuller[16]	109	27	25
Stearns[4]	395	95	24
Rosanoff[5]	213	62	29
Masselon (quoted by de Almida[6])	?	?	44
Bond[7]	20	3	15
Bond[8]	34	3	8.8
Williams and Potter[17]	200	46	23
Pollock[9]	19,927	?	40*
Wootton et al[12]	95	31	32.6
Whitehead[13]	90	32	35.5
Bond and Braceland[14]	116	37	31.9
Landis[18]	?	?	38-42*
Total (excludes figures of Masselon, Pollock and Landis)	1,402	359	25.6

*Number discharged as recovered or improved per 100 admissions during the same period.

Material

The material for this study consisted of the case records of 677 consecutive first admissions diagnosed dementia præcox. These cases were admitted to the Rochester State Hospital between July, 1927 and June, 1934, inclusive. For the purposes of this study 36 cases were discarded for the following reasons: In 21 cases the duration of the psychosis before admission could not be determined; in 5 cases the diagnosis was officially changed at a later date; 10 cases were discharged with which contact was lost within one to 14 months, averaging 4.6 months. Two of these had shown some doubtful improvement at the time of discharge, the others were unimproved.

After making these discards we had left 641 cases which were subjected to statistical analysis. These cases were first separated into groups according to type of psychosis, whether catatonic, hebephrenic, paranoid or simple. There was also a substantial group of unclassified cases, drawn largely from the admissions during the earlier years covered by the study. Each of these groups was then subdivided according to the duration of the psychosis before admission. There are no generally accepted criteria for making such a classification, since the artificial grouping of cases as "early" and "late" has been out of vogue in this country for at least three generations. We therefore adopted the arbitrary divisions used by Sakel in his reports of insulin shock therapy results, namely, less than six months, six to 18 months, and over 18 months in duration. Each of the subgroups was then studied to determine remission rates, death rates, the length of hospital residence before remission took place, the number and severity of relapses, and the length of remission in those who had relapses.

Remissions

All cases showing significant remissions were classified as either "much improved" or "improved." No attempt was made to separate recoveries from the much improved group, a difficult task at best. Lewis and Blanchard[19] in their study of 100 cases of "recovered" schizophrenics stated that these cases do show some

"degree of deterioration," "let-down in energy," "scarring," "emotional deviation." Furthermore, in our hospital the designation "recovered" was almost never applied to a case of dementia præcox during the period of this study. Our "much improved" group contained all cases showing a disappearance of all active psychotic manifestations, and returning to a substantially normal life in the community, with or without scarring of the personality and with or without good insight. The "improved" group contained all those who showed enough conduct improvement to warrant release from the hospital, but fell short of being much improved because of residual psychotic trends or conduct, or because of such severe personality scarring as to require a definitely sheltered environment. All other cases were considered "unimproved.." In order to abide consistently by these criteria we found it necessary in some cases to classify the results somewhat differently from the officially recorded "condition on discharge."

TABLE 3. REMISSIONS IN CATATONICS

Duration	Number of cases	Much improved		Improved		Unimproved	
		Number	Per cent	Number	Per cent	Number	Per cent
1-5 months	54	26	48.2	8	14.8	20	37.0
6-18 months	19	9	47.5	2	10.5	8	42.0
Over 18 months	28	7	25.0	3	10.7	18	64.3
Total	101	42	41.6	13	12.9	46	45.5

The remissions in the catatonic groups are shown in Table 3. The total improvement rates of 63 per cent in the early cases, and of 54.5 per cent in all catatonics are strikingly high, much higher than in any other form of dementia præcox. This may be in part explained by the fact that catatonia, by its very nature usually brings a patient to the hospital in the early stages of the illness. It is noteworthy that our catatonics of less than six months duration outnumbered all other catatonics and that the average duration before admission in the whole group was only 15.8 months. In all the other types of dementia præcox in our series the cases of over eighteen months duration equaled or outnumbered the two earlier groups combined, and the average duration was correspondingly

much longer. Even with these reservations, however, the figures are high. This is in line with Kraepelin's belief that the catatonic form is the most likely to show good remissions. The only figures in the literature which closely approximate ours, however, are those of Strecker and Willey[10] who reported 40 per cent of 45 catatonics as recovered. Figures ranging from 3.3 per cent to 25 per cent of recoveries are reported by Kraepelin[2], Coles and Fuller[16], Bellinger[20], and by Kahlbaum, Meyer, Räcke, Stern, and Mattauschek (the five last named quoted by Kraepelin[15]).

TABLE 4. REMISSIONS IN HEBEPHRENICS

Duration	Number of cases	Much improved		Improved		Unimproved	
		Number	Per cent	Number	Per cent	Number	Per cent
1-5 months	38	15	39.5	10	26.3	13	34.2
6-18 months	38	11	29.0	4	10.5	23	60.5
Over 18 months	75	3	4.0	17	22.7	55	73.3
Total	151	29	19.2	31	20.5	91	60.3

The remissions in the hebephrenic groups are shown in Table 4. The rate of 19.2 per cent of all hebephrenics much improved is not far from what one might expect, but it is noteworthy that practically all of the good remissions took place in the cases of 18 months or less duration. Thirty-nine and five-tenths per cent of cases of less than six months duration were much improved, as contrasted with only 4 per cent of cases having a duration of over 18 months. These older cases had an average duration of 71.2 months at the time of admission, and the total group of hebephrenics had an average duration of 38.8 months. In the literature recovery rates reported for hebephrenics are Kraepelin's[2] 8 per cent, Mattauschek's 2.3 per cent, (quoted by Kraepelin[15]), Whitehead's[13] 14.3 per cent, and Strecker and Willey's[10] 16.3 per cent. Coles and Fuller[16] report a 20.8 per cent improvement rate, and Whitehead[13] reports 20.6 per cent improved.

The remissions in the paranoid groups are shown in Table 5. It is noteworthy how few early cases there are in the whole group and that the percentage of much improved is comparatively small, even in the early cases. Many of these paranoids had been ill for

a great many years before admission. The cases of over 18 months duration had an average duration of 108.2 months, and the paranoid group as a whole averaged 72 months in duration. The low water mark of only 10.5 per cent much improved in the whole group is in line with Kraepelin's[21] gloomy prognosis for these cases when he wrote that "the outcome is always deterioration." Kraepelin[15] quoted Mattauschek as reporting 11.1 per cent recoveries, Strecker and Willey[10] reported 14.1 per cent, and Whitehead[13] reported 8 per cent. Coles and Fuller[16] and Whitehead[13] report 25 per cent and 27 per cent improvement rates, respectively.

TABLE 5. REMISSIONS IN PARANOIDS

Duration	Number of cases	Much improved		Improved		Unimproved	
		Number	Per cent	Number	Per cent	Number	Per cent
1-5 months	29	7	24.1	7	24.2	15	51.7
6-18 months	50	5	10.0	11	22.0	34	68.0
Over 18 months	139	11	7.9	24	17.3	104	74.8
Total	218	23	10.5	42	19.3	153	70.2

The remissions in the unclassified groups are shown in Table 6. No ready explanation is available for the comparatively low remission rates in this group. It may be noted that nearly all the cases in this group were admitted during the earliest years covered by this study. These cases came to the hospital fairly late in the course of the psychosis; those of over 18 months duration averaged 107 months and the total group averaged 57.7 months in duration.

TABLE 6. REMISSIONS IN UNCLASSIFIED CASES

Duration	Number of cases	Much improved		Improved		Unimproved	
		Number	Per cent	Number	Per cent	Number	Per cent
1-5 months	38	9	23.6	5	13.1	24	63.3
6-18 months	41	3	7.3	7	17.1	31	75.6
Over 18 months	82	11	13.4	6	7.3	65	79.3
Total	161	23	14.3	18	11.2	120	74.5

There were only 10 cases diagnosed dementia præcox, simple type. Because of the paucity of the number these cases were not

tabulated in groups according to the length of duration. One case was much improved, three were improved, and six unimproved. These 10 cases had an average duration of 52 months.

TABLE 7. REMISSIONS IN ALL CASES

Duration	Number of cases	Much improved		Improved		Unimproved	
		Number	Per cent	Number	Per cent	Number	Per cent
1-5 months	161	57	35.4	31	19.2	73	45.4
6-18 months	150	28	18.6	25	16.7	97	64.7
Over 18 months	330	33	10.0	51	15.4	246	74.6
Total	641	118	18.4	107	16.7	416	64.9

Table 7 shows the remission rates in all cases, grouped according to duration of psychosis, without reference to classification. The differences between 35.4 per cent much improved in the early cases, 10 per cent in the late cases, and 18.4 per cent in all cases can scarcely be minimized. Not only in this table, but also in the preceding ones, there is a consistent direct proportion between the duration of the psychosis and the percentage unimproved. This would seem to indicate that there is little reliability in figures relating to dementia præcox which give no information about duration or type of psychosis. Our total group had an average duration of 51.4 months at the time of admission.

TIME OF REMISSIONS

When comparisons are made between the so-called "spontaneous" remissions and those following the newer methods of treatment, it is often asserted that the latter produce remissions earlier than they would occur spontaneously, thus shortening hospital residence. In order to establish a baseline for comparison of this phase of the remission question, we determined and recorded the time of remission in each case to the best of our ability. This determination was made from data in the continued notes in the case records. In most cases the date agreed upon as the time of remission antedated the parole date by one to several months. In a few cases the date of remission was some time following parole. It

may be observed in this connection that we chose the time when improvement had finally reached its maximum, rather than the time when improvement began. We felt loath to use the date of parole as the date of remission because it has been so customary to doubt the validity of an apparent remission in dementia præcox, and to adopt a policy of skeptical watchful waiting.

TABLE 8. TIME OF REMISSIONS

Group	Number	Per cent with remissions within 3 months	6 months	9 months	12 months	Average months, hospital residence before remission
Catatonics	55	33	60	76	80	8.6
Hebephrenics	60	33	60	72	82	7.7
Paranoids	65	19	42	53	65	12.2
Unclassified	41	24	53	70	82	7.7
Simple	4	0	25	25	50	24.7
1-5 months duration	88	33	58	72	82	8.7
6-18 months duration	53	24	50	67	75	9.0
Over 18 months duration	84	21	48	59	70	10.7
Total	225	27	53	66	76	9.5

Table 8 shows percentage of remissions appearing during different lengths of time following admission, and average hospital residence before remission in various groups. The table is not broken down into the smaller subgroups because this would make the numbers too small for statistical purposes. Most of the groups seem to strike about the same average except the paranoid group, in which there is relative delay before remission. There is also a slight but quite consistent tendency for remissions to develop earlier in the cases of shorter duration. The general average of 9.5 months of hospital residence before remission is of course considerably longer than the two or three months required for the new shock therapies. It is noteworthy, however, that over half of the "spontaneous" remissions occur within six months, and three-fourths within a year of admission.

Relapses

It is obvious that figures on the number of patients who achieve remissions are in themselves of incomplete value, if it is not known how long the remissions last, and how many are maintained over a substantial period of time. All of our cases who had left the hospital were followed up either by letter or by interview with a social worker. Practically all of this part of our study was carried out during December, 1937, January and February, 1938, so that at least three and one-half years had elapsed since admission in every case.

Some of the results of the followup study are shown in Table 9. It is seen that 49.4 per cent of all the cases who had shown remissions had no relapse during the followup period.

Table 9. Relapses

	Number of cases	No relapse		Temporary relapse		Permanent relapse		Not traced	
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Much improved..	118	67	56.8	15	12.7	15	12.7	21	17.8
Improved	107	44	41.1	13	12.2	34	31.8	16	14.9
Total	225	111	49.4	28	12.4	49	21.8	37	16.4

Twelve and four-tenths per cent had temporary relapses, that is, there was a break in adjustment with subsequent return to about the former level of remission. The relapses came on after an average length of remission of 22 months. Ten of the 28 patients in this group had two or more relapses with subsequent remission.

Twenty-one and eight-tenths per cent were tabulated as permanent relapses. These were the patients who had again become actively psychotic and remained so up to the time of the followup study. The relapses in this group occurred after an average length of remission of 28 months.

With the remaining 16.4 per cent contact was lost on an average of nine months after remission.

As would be expected, the much improved group maintained re-

missions much better than did the improved group. In both groups however, the remissions were maintained rather better than a survey of the literature would lead one to expect. Kraepelin[1] in the second edition of his lectures doubted if dementia præcox was ever really curable, and stated that most cases relapsed sooner or later. In 1899[2] he held that the remissions were usually of less than five years. In the eighth edition of his textbook[15] he maintained that although the course is frequently interrupted by more or less complete remissions, there are usually fresh exacerbations and terminal dementia. He gave figures on length of remissions in 127 patients and concluded that "in the great majority of cases—periods of improvement do not last longer than three years." Rosanoff[5], Stearns[4], MacNamara and his associates[22], Fuller[23], Horwitz and Kleiman[24], and Wootton and his associates[12] have made reports of the course of events after discharge of cases of dementia præcox which total 839 when the reports are combined. Quite dissimilar criteria were used and variable results were obtained in these various studies; moreover, some of them include cases which were discharged unimproved. However, the cases reported as active in hospital in all these studies total 335, or 40 per cent of the total, which outcome obviously compares unfavorably with that of our group.

Deaths

At the time of the followup study 69, or 10.8 per cent, of our cases were known to be dead within a period averaging 31 months after admission. Of these, 58 died unimproved within an average period of 28.5 months after admission. Six died during remissions in an average of 46.5 months after admission; the remissions averaged 37 months. Five died during relapses after remissions within 41.4 months on the average after admission; the remissions having lasted an average of 11 months before relapse. The primary cause of death was pneumonia in 15 cases, tuberculosis in 17, heart disease in 8, cancer in 5, arteriosclerosis in 3, suicide in 5, and miscellaneous causes in the other 16.

Summary

1. Six hundred and forty-one cases of dementia præcox were studied in an attempt to determine the prognosis in special groups classified according to type of psychosis and according to duration of psychosis before admission.

2. In 101 catatonic cases 41.6 per cent were much improved and 12.9 per cent improved.

3. In 151 hebephrenic cases 19.2 per cent were much improved and 20.5 per cent improved.

4. In 218 paranoid cases 10.5 per cent were much improved and 19.3 per cent were improved.

5. In 161 cases of less than six months duration 35.4 per cent were much improved and 19.2 per cent improved.

6. In 150 cases of 6 to 18 months duration 18.6 per cent were much improved and 16.7 per cent improved.

7. In 330 cases of over eighteen months duration 10.0 per cent were much improved and 15.4 per cent improved.

8. In all 641 cases 18.4 per cent were much improved and 16.7 per cent improved.

9. The remissions developed in an average of 9.5 months after admission.

10. During the followup period, which varied between three and one-half and ten and one-half years, 49.4 per cent of the 225 remissions were maintained, 12.4 per cent had temporary relapses, 21.8 per cent had permanent relapses, and 16.4 per cent were not traced.

11. At the time of the followup study 69, or 10.8 per cent, of the cases were known to be dead, most of them having died unimproved.

REFERENCES

1. Kraepelin, E.: Lectures on Clinical Psychiatry. Transl. from second German ed., New York, 1917.
2. Kraepelin, E.:Zur Diagnose und Prognose der Dementia præcox. Allg. Ztschr. f. Psychiat., 56:254-263, 1899.
3. Hecht, D. O.: A study of dementia præcox. J. Nerv. and Ment. Dis., 32:689-712. Nov., 1905, and 763-790, Dec., 1905.
4. Stearns, A. W.: The prognosis in dementia præcox. Boston M. and S. J., 167:158-160, Aug. 1, 1912.
5. Rosanoff, A. J.: A statistical study of prognosis in insanity. J. A. M. A., 62:3-6, 1914.

6. de Almida, W.: The diagnosis, remissions, and treatment of dementia præcox. Dementia Præcox Studies, 2:199-217, 1919.

7. Bond, E. D.: A review of the five-year period following admission in 111 mental patients. Am. Jour. Insan., 77:385-384, Jan., 1921.

8. Bond, E. D.: Results in 251 cases five years after admission to a hospital for mental diseases. Arch. Neurol. and Psychiat., 6:429-439, Oct., 1921.

9. Pollock, H. M.: Outcome of mental diseases in the United States. Ment. Hyg., 9:783-804, 1925.

10. Strecker, E. A., and Willey, G. F.: Prognosis in schizophrenia. J. Ment. Sci., 73:9-39, Jan., 1927.

11. Levin, H. L.: Recovery in dementia præcox; report of 35 cases. PSYCHIAT. QUART., 5:476-491, July, 1931.

12. Wootton, L. H., Armstrong, R. W., and Lilley, D.: After histories of discharged mental patients. J. Ment. Sci., 81:168-172, Jan., 1935.

13. Whitehead, D.: Prognosis in dementia præcox. PSYCHIAT. QUART., 11:383-390, July, 1937.

14. Bond, E. D., and Braceland, F. J.: Prognosis in mental disease. Use of one-page abstracts. Am. J. Psychiat., 94:263-274, Sept., 1937.

15. Kraepelin, E.: Dementia Præcox and Paraphrenia. Transl. by R. Mary Barclay. Eighth ed., Edinburgh, 1919.

16. Coles, W. W., and Fuller, S. C.: A statistical study of one hundred and nine cases of dementia præcox. J. Am. Inst. Homeop., 1:322-327, 1909.

17. Williams, R. R., and Potter, H. W.: The significance of certain symptoms in the prognosis of dementia præcox. STATE HOSP. QUART., 6, 361-480, 1921.

18. Landis, C.: Chapter V. A statistical evaluation of psychotherapeutic methods, in Hinsie, L. E.: Concepts and problems of psychotherapy. New York, 1937.

19. Lewis, N. D. C., and Blanchard, E.: Clinical findings in "recovered" cases of schizophrenia. Am. J. Psychiat., 11:481-492, Nov., 1931.

20. Bellinger, C. H.: Prognosis in schizophrenia—catatonic form. PSYCHIAT. QUART., 6:475-487, July, 1932.

21. Kraepelin, E.: Clinical Psychiatry. Abstracted and adapted from the seventh German ed., by A. Ross Defendorf, New York, 1907.

22. McNamara, L. T., Read, C. F., and Ettleson, A.: Study of social readjustment of 100 cases of dementia præcox, together with some psychiatric comment upon those reported recovered. Collect. and Contrib. Papers, Elgin State Hosp., 93-109, Dec., 1932.

23. Fuller, R. G.: What happens to mental patients after discharge from hospital. PSYCHIAT. QUART., 9:95-104, Jan., 1935.

24. Horwitz, W. A., and Kleiman, C.: Survey of cases of dementia præcox discharged from Psychiatric Institute and Hospital. PSYCHIAT. QUART., 10:72-86, Jan., 1936.

SOME COMPARISONS BETWEEN INSULIN-TREATED AND NONINSULIN-TREATED CASES OF SCHIZOPHRENIA

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In attempting a comparative survey between insulin-treated and noninsulin-treated dementia præcox patients one is treading uncertain ground. One's observations and conclusions are constantly open to challenge, and rightfully so. In any study of a subject such as dementia præcox, where so many variables must be taken into consideration, dogmatic conclusions cannot be made with any certainty. These variables, as we know, are numerous. To mention a few, they are: age, sex, race, physical constitution, duration of illness, social and economic status, the family constellation, heredity, and psychological factors. The scope of this paper does not take cognizance of all these factors. Rather than to point out iron-bound conclusions, it is hoped instead to indicate certain trends which of necessity must remain open to confirmation or disproval by time and further investigation.

We are contrasting a group of 195 patients diagnosed dementia præcox, who were not treated with insulin, against a group of 45 insulin-treated cases. This ratio of about 4½ to 1, strictly speaking, is hardly an adequate basis for comparison. We consider our group of treated individuals too small for adequate sampling but on the basis of our work thus far, we hope to indicate something of the value of hypoglycemic treatment in dementia præcox.

During the fiscal year, July 1, 1936 to June 30, 1937, there was admitted to Creedmoor State Hospital a total of 224 dementia præcox patients. Nineteen of these were subsequently chosen for insulin therapy, and 10 others were not considered because they were discharged for various reasons. There remained 195 routine treated cases to be reviewed. This group was broken up according to duration of illness as accurately as could be determined. There were 82 patients in this group who were ill about six months, 15 about one year, 25 about two years, and 73 ill for more than two years. Up to the time of writing, 58 cases of this number had been paroled. Grouped according to duration of illness, the paroles

were as follows: 27 from the six-months group, 4 from the one-year group, 10 from the two-year group and 17 from the category of chronic cases. Expressed in percentages they are respectively 32.7 per cent, 26.6 per cent, 40 per cent and 23.2 per cent. Taking the entire 195 cases as a whole, the percentage paroled amounts to 29.7.

However, close investigation of paroled noninsulin-treated cases reveals the fact that a number of them were, strictly speaking, not really improved when they left the hospital. They were allowed to go home because relatives asked for their parole and promised good care and supervision, and because the patients were not considered dangerous either to themselves or others. In considering a patient to be improved, that individual must have shown at least a favorable change in mental content. A change in conduct alone is probably not a suitable criterion for labeling a patient improved. The writer has no quarrel with the policy of paroling harmless patients, but for statistical purposes, one should qualify their parole as having occurred on the basis of expediency rather than on the basis of mental improvement. This particular point is stressed because in contrasting the parole cases in the noninsulin-treated group, with those in the insulin-treated group, we feel that the patients sent home from the latter category really showed distinct favorable changes not only in conduct but in the mental sphere as well.

Up to the time this paper was written we had completed insulin therapy in 45 cases. Twenty-seven of these showed enough improvement to warrant parole, thus making a parole percentage of 60. The first parole has been out slightly more than nine months, the last about two weeks. According to the duration of illness these 45 may be broken up as follows: 14 ill six months, 8 one year, 9 two years, 14 over two years. Expressed in percentage of improvement, they are respectively 78.5 per cent from the six-month group, 37.5 per cent from the one-year group, 66.6 per cent from the two-year group, and 50 per cent from the chronic group. If we now compare these figures with those obtained in the control group, we find that in each category of the treated individuals there is a noticeably higher percentage of improvement than in the controls. The point may be raised that our material has been selected from

cases with favorable prognoses. This is not entirely so. We have tried, whenever possible, to get cases under two years duration and there were 22 of these in our series; but the other 23 were ill two years or longer and in general had a poor outlook.

COMPARISON OF THE PERCENTAGE OF PAROLES IN THE NONINSULIN-TREATED AND INSULIN-TREATED GROUPS, ACCORDING TO DURATION OF ILLNESS

	Six months Per cent	One year Per cent	Two years Per cent	Over two years Per cent
Noninsulin-treated group (control group).....	32.7	26.6	40	23.2
Insulin-treated group	78.5	37.5	66.6	50

At the beginning of this investigation a question presented itself: Does this treatment, when effective, shorten the course of the mental illness? We have found that it does. In the treated series the shortest period of therapy for patients paroled was six weeks, the longest four months. For the whole group there was an average of about three months from the time the therapy was started to the time the patient went home. In the noninsulin-treated category hospitalization varied from two to 18 months and the average for the entire group was slightly over six months. The implication may be that if dementia præcox patients could receive this treatment shortly after admission, the hospital residence of those who improved could be shortened by about one-half.

The point may also be raised that some of the patients in our group would have recovered spontaneously. There is no doubt in my mind that this is true. But if one accepts the premise that insulin therapy is of value, one may then counter with the following analogy. A certain number of patients with type 1 and type 2 pneumonia will recover without the use of antipneumococcus serum. But that would not be a valid reason for withholding serum in any such case of pneumonia.

As regards changes in the behavior of our treated cases, this much may be said, that the 27 paroled home showed varied but definite improvement in the mental status as well as in conduct. In contrast the 18 not improved showed practically no change. A few of the latter for a time became better behaved and more cooperative, but except in one or two cases this did not last long. As far

as we could determine there was practically no shift in the mental content of the unimproved cases. In some of them there came about an elaboration of psychotic trends while under treatment, but the ideas presented, remained fixed. One patient who had been mute for about fifteen months became quite activated each day following termination of coma, after which he would reenact the scene of the Crucifixion. He identified himself as Christ, would assume the position as if on the Cross and shout, "There is a crook on my right, there is a crook on my left." This continued for about thirty or forty minutes following which he would again lapse into a stuporous state.

None of our cases showed any change in the type of psychosis while under observation. However, we did see something of interest in one of our patients, although it can hardly be considered a change in type. This woman, aged 34, had been ill about four years. In her illness she presented some obsessive-compulsive characteristics in addition to auditory and visual hallucinations and fixed paranoid trends. Under treatment she lost these hallucinations and delusional ideas; the obsessive-compulsive ideas remained. These are still present and thus far have not yielded to psychotherapy.

The degree of restitution varied from almost complete subsidence of symptomatology without insight, to apparent eradication of symptoms accompanied by partial or good insight. However, this particular observation was not peculiar to the insulin-treated group, for the same changes were noticed in the routine-treated patients. Similarly the degree of home adjustment was variable. Five of our 27 paroles failed to adjust and were brought back, thus making 18.5 per cent returned. Of the 22 remaining on parole, all are making a fairly good adjustment. Eight are either gainfully employed or performing household duties. With the possible exception of four cases, all appear to need some form of supervision in the protected environments. In comparing the group of 129 paroled noninsulin-treated cases in the identical 8-month period during which we observed the home adjustment of our treated group, we found that 29 were returned to the hospital, a return rate of 22.4 per cent. This was about 4 per cent higher than in the treated

group, but it may be explained by the fact that a number of the 129 paroles were really poor parole material and were sent home for custodial care. As far as we could see our insulin-treated cases on parole did no better nor worse than those from the noninsulin group. Similarly to the latter group, the insulin-treated patient on parole requires frequent psychotherapeutic talks, and the factors that go to make up a sheltered environment. The author cannot see how a pharmacological procedure, such as hypoglycemic shock therapy can so modify one's personality as to insure more successful coping with an environment which may still be hostile and trying to the given individual.

The precise reason for failure of adjustment in five of our cases is uncertain. One woman's husband is quite eccentric and difficult to live with. There was no one else to whom she could go, therefore, she was paroled to his custody. In five days she was back but in better condition than at the time preceding treatment. The second case, a young man, remained on parole for two months. His home appeared suitable, although a sister was also treated by us and thus far remains well. The third return also comes from poor stock and an essentially poor home environment. The fourth had difficulty in marital adjustment. The fifth patient was paroled to a fanatically religious mother because there was no one else to take him; friction on a religious basis soon ensued.

The above examples indicate possible reasons for relapse but it is not assumed that these were the only factors militating against successful adjustment. It should be noted too, that all five were readmissions. Each had been out before but failed to adjust. This may perhaps indicate that patients who have failed on previous paroles are not suitable for treatment.

It is felt that hypoglycemic treatment is but one step in the attempt at rehabilitating the schizophrenic. When effective, it seems to bring about abatement of psychotic symptoms by suppressing them. Exactly how this occurs we are unable to state. But this suppression will not remain effective unless we can successfully cope with such factors as personality, family relationships, parental education, community attitude toward mental disease and social and economic situations. As is well recognized, liabilities of

schizophrenic patients usually predominate. These liabilities must be modified if one is to have ultimate success in any treatment program.

On the basis of our experience to date, the following implications may be drawn:

1. Hypoglycemic shock treatment seems to offer a greater chance for improvement in dementia præcox than do routine treatment measures.

2. The period of illness and hospitalization is cut short by this treatment, when it is effective.

3. The changes noted in the improved insulin-treated cases are not different from those observed in cases showing spontaneous improvement.

4. Hypoglycemic therapy does not influence the parole adjustment of improved patients; treated cases do no better nor worse than improved cases paroled from a noninsulin-treated group.

5. Relapses occur about as frequently in the treated group as in the nontreated category; 18.5 per cent in the former, 22.4 in the latter.

6. The causes of relapse are not easily determined. A combination or any one of the factors already mentioned may be to blame.

7. Hypoglycemic treatment, when effective, is only one step in the process of rehabilitating the schizophrenic. Considerable attention must directed be to psychological and environmental factors.

STATISTICAL COMPARISONS BETWEEN PREINSULIN AND INSULIN ERAS

Recoveries and Improvements

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The advent of insulin treatment has created a schizophrenia consciousness with the result that dementia præcox patients have begun to receive more attention than they have probably had since the time when Kraepelin and Bleuler focussed attention on this particular group. In the search for suitable material for insulin therapy, patients who had been heretofore considered chronic became objects of special interest, while those recently admitted have received particular scrutiny as the most likely to benefit from the therapy. The question therefore arose whether the awakening of interest in schizophrenia and the therapeutic resurgence caused an increase in the number of recorded remissions. It was felt that this question might best be answered by comparing the number of paroles from the schizophrenic group during the year when insulin was used with the number of paroles during the preceding years.

Method

Since the insulin treatment was instituted at Hudson River State Hospital during January, 1937, and since a group of about seventy patients underwent a course of treatment by the end of the year, it was decided to use the calendar year as a unit for the study. The records of all cases of dementia præcox admitted during the past six years were scrutinized and the various facts tabulated. Similarly the records of all paroled dementia præcox patients during the same years were studied. It is a routine procedure in the New York State institutions to parole escaped patients who do not return within 24 hours. Such paroles were not considered in this study since none of these patients showed any evidence of improvement at the time of escape and most of them have been returned to the hospital. Patients who were transferred to other institutions were also excluded from this study, as their departure did not imply a change in their mental condition.

In order to ascertain what possible relation might exist between improvement and other factors in the patient's life, the various data were statistically elaborated and compared. The term recovery was applied to patients who at the time of parole showed no defect in the emotional sphere, who had insight into their psychotic experience and were ready to resume a gainful existence in the community. An objection to such conception may be that it is somewhat exacting. Much improved was applied to patients who retained some defect in the emotional sphere, who corrected to a considerable extent their delusional ideas and were ready to return to a gainful existence in the community. Improved was applied to patients with a definite defect in the emotional sphere, who rationalized their trends rather than corrected them and who could be expected to make only partial rehabilitation in the community. Finally, slightly improved was reserved for patients who showed improvement in their general behavior and conduct only, but no change in the course of the psychosis.

General Survey of the Admissions, Paroles and Returns

The highest number of dementia præcox admissions, 173, took place in 1933 (Table 1): 1932 followed with 158 admissions; 1937 occupies third place with 138 admissions; 1935 followed with 134; 1936 with 111 and 1934 with the lowest, 106 admissions. The high admission rate in 1933 may be explained speculatively on the basis of the then prevailing economic stress and willingness of relatives to hospitalize their patients in order to lighten their own burdens. This assumption, however, does not explain the sharp drop in 1934. An average of almost 45 per cent of the total admissions were readmissions, some of the patients have had more than one previous admission with temporary remissions. This fact is important to keep in mind evaluating the general frequency of improvement.

The number of paroles varied annually. The lowest numbers were recorded in 1934 and 1936 with 56 each year, the highest, 79, in 1937. In 1932 and 1935 there were 64 paroles, while in 1933, 61 patients were paroled. However, if we consider the percentages, as based on the number of admissions during the same years the lowest rate of paroles amounted to 35.2 per cent in 1933, followed by

40.5 per cent in 1932, 47.7 per cent in 1935, 50.4 per cent in 1936, 52.7 per cent in 1934 and finally 57.2 per cent in 1937.

To sum up we can say then that there was only a slightly higher percentage of paroles during the insulin year as compared with previous years. It was only 5 per cent greater than in 1936. If we consider the fact that among the 79 patients paroled during 1937, 20 have improved under insulin treatment and 12 others had spontaneous remissions during the process of preparation for treatment, the total increase in the percentage of improvement can scarcely be considered spectacular.

As to the relapses and returns to the hospital the highest percentage, amounting to 45.3, was recorded in 1932, followed by 36.0 in 1933, 35.9 in 1935, 33.9 in 1936, 32.1 in 1934 and 19.0 in 1937. The high return rates in 1932 and 1933 could possibly be explained by the general poor economic condition and the inability of relatives to support patients.

TABLE 1. ANNUAL ADMISSIONS, PAROLES AND RETURNS

	1932		1933		1934		1935		1936		1937	
	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent
Total admissions	158	..	173	..	106	..	134	..	111	..	138	..
First admissions	98	62.0	103	59.1	64	60.4	72	53.7	66	59.5	76	55.0
Paroles	64	40.5	61	35.2	56	52.7	64	47.7	56	50.4	79	57.2
Returns	29	45.3	22	36.0	18	32.1	22	35.9	19	33.9	15	19.0

TYPES OF SCHIZOPHRENIA ON ADMISSION AND ON PAROLE

According to the types of schizophrenia the paranoid form predominated numerically in the admission groups during the entire six-year period (Table 2). It constituted 61.3 per cent of the dementia præcox admissions in 1934, 59.5 per cent in 1933, 57.6 per cent in 1936, 56.7 per cent in 1935, 54.3 per cent in 1937 and 42.4 per cent in 1932. In the parole groups the paranoid type was also the largest with the exception of 1932 when the hebephrenic group predominated (Table 2). The highest percentage of 46.4 was recorded in 1934, followed by 41.7 in 1937, 40.6 in 1935, 39.4 in 1936, 37.7 in 1933 and 31.2 in 1932. With the exception of 1934 the admission and the parole percentages did not parallel annually. The

second place on admission was taken by the catatonic group with the highest percentage of 37.7 in 1935 and the lowest, 19.6 in 1933. This form took third place in the parole group except for the last two years. The highest percentage of 37.9 was in 1937 and the lowest, 18.7 in 1932. The hebephrenic group showed its highest percentage of admissions during 1932 amounting to 27.2, gradually diminishing during the subsequent years. The percentage of this type in the parole group was also highest during 1932 amounting to 45.3, while during the subsequent years the average was about 25. The simple type showed the lowest figures both in the admission and the parole groups, being less than 5 per cent. Altogether the paranoid type was represented with the highest average both at the time of admission and the time of release, which is in accord with prevailing statistics.

TABLE 2. TYPES OF SCHIZOPHRENIA ON ADMISSION

	1932		1933		1934		1935		1936		1937	
	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent
Paranoid	67	42.4	103	59.5	106	61.3	76	56.7	64	57.6	75	54.3
Catatonic	42	26.5	34	19.6	23	21.7	40	37.7	25	22.5	34	24.6
Hebephrenic ...	43	27.2	31	17.9	16	15.0	14	10.4	16	14.4	23	16.5
Simple	6	3.8	5	2.8	2	1.8	4	2.9	6	5.4	6	4.4

TYPES OF SCHIZOPHRENIA ON PAROLE

	1932		1933		1934		1935		1936		1937	
	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent
Paranoid	20	31.2	23	37.7	26	46.4	26	40.6	22	39.4	33	41.7
Catatonic	12	18.7	15	24.5	12	21.4	15	23.4	19	33.9	30	37.9
Hebephrenic ...	29	45.3	20	32.5	12	21.4	20	31.2	13	23.2	15	18.9
Simple	3	4.6	3	4.9	6	10.7	3	4.6	2	3.5	1	1.2

AGE ON ADMISSION OF PAROLED PATIENTS

The youngest patient admitted during the six-year period was aged 14 years, while the oldest was 60 (Table 3). Virtually all the older patients had previous attacks with remissions, and as a group were statistically unimportant. The average age of all patients admitted during the 1932-1936 period fluctuated between 30

and 31.75 years while the average age on admission in 1937 was 25.33 years. This may be explained in the recent tendency to send the younger patients to the hospital as it became generally known in the community that the hypoglycemic shock treatment offers best possibilities in the young.

TABLE 3. AGE OF PAROLE PATIENTS ON ADMISSION

	1932		1933		1934		1935		1936		1937	
	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.
Youngest	15	..	14	..	15	..	16	..	16	..	15	..
Oldest	59	..	54	..	60	..	51	..	59	..	52	..
Average	31	5	30	1	30	..	30	9	31	8	25	4

DURATION OF PSYCHOSIS PRIOR TO ADMISSION

The duration of psychosis in the paroled group as estimated up to the time of admission ranged from about 1 week to 25 years, with annual averages running from 2 years, 2 months to 4 years, 3 months (Table 4). The lowest average was noted in 1935 and the next lowest in 1937. It may be also observed that the extremes in 1937 were in favor of the shorter durations.

TABLE 4. DURATION OF PSYCHOSIS PRIOR TO ADMISSION

	1932		1933		1934		1935		1936		1937	
	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.
Shortest	..	1	..	1	..	2	..	2	..	2	..	¼
Longest	22	..	25	..	15	..	10	..	20	..	14	..
Average	2	8	4	3	3	..	2	2	2	9	2	6¼

DURATION OF IMPROVEMENT BEFORE PAROLE

It was practically impossible to correlate the duration of improvement prior to release with the degree of improvement by types and we shall therefore give only our general findings (Table 5). The shortest duration of improvement was one month and the longest five years with an average of two and one-half months in 1932 and 1936; two and one-quarter months in 1933 and 1934, three and one-half months in 1935 and six and one-quarter months in 1937.

TABLE 5. DURATION OF IMPROVEMENT BEFORE PAROLE

	1932		1933		1934		1935		1936		1937	
	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.
Shortest	..	1	..	1	..	½	..	1	..	1	..	1½
Longest	..	10	..	10	..	6	2	..	1	3	5	..
Average	..	2½	..	2¼	..	2¼	..	3½	..	2½	..	6¼

DURATION OF HOSPITAL RESIDENCE OF PAROLED PATIENTS

The shortest hospital residence was one month and the longest was 25 years with an average of one year and nine months in 1932, one year seven and one-quarter months in 1933, two years, one month in 1934, three years and one month in 1935, two years and five months in 1936 and two years and one and one-quarter months in 1937 (Table 6). Generally speaking the hospital residence of improved cases during the insulin year does not differ greatly from that in the previous years.

TABLE 6. DURATION OF HOSPITAL RESIDENCE

	1932		1933		1934		1935		1936		1937	
	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.	Yrs.	Mos.
Shortest	..	1	..	1¼	..	1¾	..	1¾	..	1	..	2¾
Longest	20	..	11	..	14	..	25	6	14	6	13	1
Average	1	9	1	7¼	2	1	3	1	2	5	2	1¼

DURATION OF PAROLE BEFORE RETURN

We mentioned in the beginning that a number of paroled patients were returned to the hospital and that the lowest percentage was observed during the insulin year (Table 7). In estimating the duration of residence in the community the shortest was one day and the longest 11 months, 23 days. The averages were five months and seven days in 1934, five months in 1935, four months in 1936 and only two months, 15 days in 1937. It is rather surprising to note that the shortest residence outside was recorded during the insulin year when the smallest number of returns to the hospital took place.

TABLE 7. DURATION OF PAROLE BEFORE RETURN

	1932		1933		1934		1935		1936		1937	
	Mos.	Das.	Mos.	Das.	Mos.	Das.	Mos.	Das.	Mos.	Das.	Mos.	Das.
Shortest	..	9	..	10	..	7	..	1	..	3	..	23
Longest	11	23	11	23	11	7	9	..	10	15	5	15
Average	5	7	6	7	4	7	5	..	4	..	2	15

Degree of Improvement

No recoveries were recorded during the 1932-1936 year period (Table 8). In 1937 three patients, 3.8 per cent, were considered recovered. The percentage of patients who were considered much improved in 1937 was considerably lower than in the preceding years. The highest percentage, 37.7, was recorded in 1933, followed by 34.3 in 1932, 33.9 in 1936, 32.1 in 1934 and 21.8 in 1935. The percentage in 1937 was 11.4. The improved group was the largest during the entire six-year period, with 60.9 per cent in 1932, 59.1 per cent in 1933, 57.8 per cent in 1935, 55.3 per cent in 1934, 54.4 per cent in 1937 and 50.0 per cent in 1936. The highest percentage of the slightly improved cases, 27.7, occurred in 1937, while during the previous years the percentage ranged from zero in the first two years to 12.5 in 1936.

It may not be amiss at this point to compare the percentages of the various degrees of improvement in our material with those given in the annual reports of the Department of Mental Hygiene for the same years (Table 8). We must point out, however, that the statistics given by the department are based on the figures at the time of discharge of the patients while on parole. We could not follow this procedure since none of the patients paroled in 1937 were discharged and so no comparisons either with the departmental statistics or with our own figures for the previous years could be made. The percentages of recoveries as recorded by the department during these years ranged from 3.9, the lowest, in 1932, to 6.7, the highest, in 1936. These percentages are somewhat higher than ours of 1937 (3.8). The department percentages for the much improved group are about the same as our own during the 1932-1936 period and about three times higher than those of 1937. This, as already indicated, may be explained by the fact that our percentages for the improved group are much higher than those given by the department, and in addition we also had a group of slightly improved patients, with the highest number in 1937, a group which has not been considered by the department. The percentages for our unimproved cases are lower than those given by the department. Using five groups instead of the department's four, there may be some difficulty in making comparisons. How-

ever, if we combine the much improved and the improved groups in the report of the department, and do the same with our groups adding some of the slightly improved cases, our total will approximate that of the department.

TABLE 8. CONDITION ON PAROLE

	1932		1933		1934		1935		1936		1937	
	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent
Recovered	0	..	0	..	0	..	0	..	0	..	3	3.8
Much improved	22	34.3	23	37.7	18	32.1	14	21.8	19	33.9	9	11.4
Improved	39	60.9	36	59.1	31	55.3	37	57.8	28	50.0	43	54.4
Sl. improved...	0	..	0	..	2	3.5	6	9.3	7	12.5	18	22.7
Unimproved ...	3	4.6	2	3.2	5	8.9	7	10.9	2	3.5	6	7.6

MENTAL HYGIENE DEPARTMENT ANNUAL REPORT
Condition on Discharge

	1932 Per cent	1933 Per cent	1934 Per cent	1935 Per cent	1936 Per cent
Recovered	3.9	5.4	4.5	6.5	6.7
Much improved	33.8	35.1	39.9	43.2	43.4
Improved	37.9	34.2	31.6	31.2	37.8
Unimproved	22.4	25.3	24.0	19.1	12.1

DURATION OF PSYCHOSIS AND DEGREE OF IMPROVEMENT

As we know, close attention has always been given to the correlation between the duration of psychosis and the degree of improvement. Various claims were made since the time of Kraepelin as to this interrelation. Kraepelin originally claimed real improvement in 26 per cent of the cases with a psychosis of a few months duration. Later he modified this view and even went so far as to cast considerable doubt on the whole question of recovery in dementia præcox. Subsequent investigators claimed recovery in roughly 15 to 20 per cent in dementia præcox with acute onset. In the analysis of our own material we follow the criteria of duration as given by other workers, considering three groups: less than six months; between six and 18 months and over 18 months. We found in our series no recoveries in any of these groups during the years 1932 to 1936, inclusive (Table 9). There was one recovery

with a duration of psychosis less than six months and there were two recoveries with duration between six and 18 months during 1937. Two of these patients were treated with insulin about eight months after the onset; the third developed a spontaneous remission about five months after the onset. The highest percentage much improved in the group "less than six months" amounted to 14.2 in 1936, followed by 9.3 in 1935, 7.1 in 1934, 6.2 in 1932, and 5.0 in 1937. The last figure may be compared with that of the improved cases in the same group for that year, which is almost three times as high as the highest previously recorded, in 1935.

TABLE 9. DURATION OF PSYCHOSIS AND DEGREE OF IMPROVEMENT

	1932		1933		1934		1935		1936		1937	
	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent
Less than 6 months												
Recovered	0	0	0	0	0	0	0	0	0	0	1	1.2
Much improved	4	6.2	3	4.9	4	7.1	6	9.3	8	14.2	4	5.0
Improved	5	7.8	4	6.5	2	3.5	6	9.3	5	8.9	19	24.0
Sl. improved ...	0	0	0	0	0	0	1	1.5	0	0	4	5.0
Unimproved ...	0	0	0	0	1	1.7	0	0	0	0	1	1.2
From 6 to 18 months												
Recovered	0	0	0	0	0	0	0	0	0	0	2	2.5
Much improved	9	14.0	7	11.4	5	8.9	2	3.1	4	7.1	2	2.5
Improved	14	21.8	13	21.3	8	14.2	16	25.0	11	19.8	8	10.0
Sl. improved...	0	0	0	0	1	1.7	4	6.2	1	1.7	7	8.8
Unimproved ...	2	3.1	1	1.6	2	3.5	3	4.6	0	0	0	0
Over 18 months												
Recovered	0	0	0	0	0	0	0	0	0	0	0	0
Much improved	9	14.0	14	22.8	9	16.0	5	7.8	7	12.5	2	2.5
Improved	20	31.2	18	29.5	21	37.5	16	25.0	12	21.4	17	21.5
Sl. improved ...	0	0	0	0	1	1.7	1	1.5	6	10.7	8	10.0
Unimproved ...	1	1.5	1	1.6	2	3.5	4	6.2	2	3.5	4	5.0

As mentioned before there were no recoveries recorded in the group "six to 18 months" duration during the 1932-1936 period. There were two recoveries in 1937. The much improved group was again the lowest in 1937. In the other years it fluctuated between 3.1 per cent in 1935 and 14.0 per cent in 1932. The improved group again constituted the largest during the six-year period showing, however, a relatively smaller percentage in 1937 (10.0) as com-

pared with the previous years. The percentages during the 1932-1936 period ranged from 14.2 in 1934 to 25.0 in 1935 with an average of about 20 per cent for all years. The percentages of slightly improved ranged from 1.7 to 8.8 in 1937. No cases with slight improvement were observed in 1932 and 1933. The group "over 18 months" duration had no recoveries in any of the years. The highest percentages were again noted in the improved group with the highest at 37.5 in 1934 and the lowest, 21.4, in 1936. The 1937 percentage was about the same as that of the preceding year. The much-improved group was rather small in 1937 with 2.5 per cent while in the preceding years it amounted to an average of 15 per cent. Again a larger number of patients who were only slightly improved were observed during 1937 as compared with previous years except for 1936. A very small number of unimproved cases with over 18 months duration were paroled each year.

Comparing the percentages of all types of improvement combined and discounting the figures of the unimproved cases we see that the highest percentage for the group "less than six months" was recorded in 1936 with 23.1, the next highest 20.1 in 1935, while in the preceding three years the average was 12 per cent. In the group "over 18 months" duration the highest percentage was 55.2 which was recorded during 1934 and the lowest, 34.3, in 1935. The group "six to 18 months" duration showed percentages from 35.8 in 1932 to 24.8, the lowest, in 1934. However, the 1937 percentages were 35.2 for the "less than six months" group, 34.0 for the "over 18 months" group and 23.8 for the "six to 18 months" group. We can then say that with the exception of the insulin year the group with less than six months duration showed the lowest percentages, while that over 18 months showed the highest. The "six to 18 months" group occupied a mid-position.

Degree of Improvement and Types of Schizophrenia

The statistics in the literature regarding the relationship between improvement and types of schizophrenia are not uniform. Kraepelin first thought that the hebephrenic type had a recovery rate of 9 per cent, the paranoid, 13 per cent. It was mentioned above that later he revised his views on recovery generally. The highest percentage of improvement with insulin treatment has been

claimed for the paranoid group. Analysis of our own material during a six-year period shows no recoveries in the paranoid group in any of the years from 1932 to 1936 and a small percentage, 2.5, in 1937 (Table 10). Nor were any recoveries noted during the same years in the other three groups except for the recovery of a catatonic in 1937. Improvement was recorded in the largest number of patients in all four types. The percentage ran from 20.3 in 1932 to 30.3 in 1934 for the paranoid; from 9.8 in 1933 to 12.4 in 1935 for the catatonic group; 7.1 in 1934 to 28.1 in 1932 in the hebephrenic group and 1.5 in 1932 to 7.1 in 1934 for the simple group. It is worthy of note that in 1937 the catatonic group showed the highest percentage of improvement with the paranoid group taking second place. In the preceding years the opposite is the case.

TABLE 10. TYPES OF SCHIZOPHRENIA AND CONDITION ON PAROLE

	1932		1933		1934		1935		1936		1937	
	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent	Total	Per cent
Paranoid												
Recovered	0	0	0	0	0	0	0	0	0	0	2	2.5
Much improved	6	9.3	9	14.7	7	12.5	3	4.6	4	7.1	4	5.0
Improved	13	20.3	14	22.9	17	30.3	16	25.0	15	26.7	14	17.7
Sl. improved ...	0	0	0	0	0	0	4	6.2	3	5.3	10	12.6
Unimproved ...	1	1.5	0	0	2	3.5	3	4.6	0	0	3	3.7
Catatonic												
Recovered	0	0	0	0	0	0	0	0	0	0	1	1.2
Much improved	5	7.8	7	11.4	4	7.1	6	9.3	10	17.8	2	2.5
Improved	7	10.9	6	9.8	6	10.7	8	12.4	6	10.7	19	24.0
Sl. improved ..	0	0	0	0	1	1.7	1	1.5	2	3.5	7	8.8
Unimproved ...	0	0	2	3.2	1	1.7	0	0	1	1.7	1	1.2
Hebephrenic												
Recovered	0	0	0	0	0	0	0	0	0	0	0	0
Much improved	9	14.0	6	9.8	5	9.1	5	7.8	4	7.0	3	3.7
Improved	18	28.1	14	22.9	4	7.1	11	17.1	6	10.0	8	10.1
Sl. improved ..	0	0	0	0	1	1.7	1	1.5	2	4.0	2	2.5
Unimproved ...	2	3.1	0	0	2	3.5	3	4.6	1	1.7	2	2.5
Simple												
Recovered	0	0	0	0	0	0	0	0	0	0	0	0
Much improved	2	3.0	1	1.6	2	3.5	0	0	1	1.7	0	0
Improved	1	1.5	2	3.2	4	7.1	2	3.1	1	1.7	1	1.2
St. improved ..	0	0	0	0	0	0	0	0	0	0	0	0
Unimproved ...	0	0	0	0	0	0	1	1.5	0	0	0	0

Summary

The following observations regarding the year during which insulin therapy was begun at Hudson River State Hospital, in contrast to those of preceding years, may be worthy of note:

1. There was only a slight increase in the percentage of paroles.
2. The percentage of relapses and returns was lower.
3. The average duration of community residence of those who relapsed was shorter.
4. Few cases recovered.

Other comparative observations were:

1. The paranoid group was the largest at the time of parole with the expectation of 1932.
2. The patients who were considered improved constituted the largest group at the time of parole during the entire six-year period.
3. During the preinsulin years patients with psychoses of more than 18 months duration showed the highest percentage of improvement of all degrees combined. The group with less than six months duration had the lowest percentage of improvement. The percentages for these two groups during the insulin year were about equal.
4. In the preinsulin years, with the exception of 1932, the paranoid group showed the highest percentage of cases improved, with the catatonic group next. During the insulin year the reverse was the case.

INSULIN THERAPY AND ITS COMPLICATIONS IN THE TREATMENT OF THE PSYCHOSES

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Every therapeutic procedure that is at all heroic usually is accompanied to a greater or less degree by complications. Insulin hypoglycemic therapy for the treatment of the psychoses comes under this category and to those of us who have seen it administered, the wonder is that there are not more mishaps attending its use.

The purpose of this paper is a brief presentation of the complications which have come to the attention of the writer, through personal experience or visits to other clinics, or those recorded in some of the literature. For the sake of convenience, they will be divided into four groups. The first includes those occurring before coma, the second those developing during coma, the third is reserved for complications noted after the termination of coma and the fourth for those existing while the patient is in coma and after termination.

Complications Preceding Coma

To the best of the writer's knowledge, there are only two or three occurring under this heading. The first is explainable on an anaphylactic basis. Some patients who show allergic sensitivity to beef, pork, or lamb, may be sensitive to insulin derived from these sources.[1] This will be shown by urticaria or an unusually severe hypoglycemic reaction from which they are revived with difficulty. A given dose of insulin may after repetition produce a reaction which is unusually severe and out of proportion to its former effect. The second is a convulsive seizure which may occur within an hour after insulin has been injected. The third is the so-called "hunger row" wherein the patient vigorously demands food because of extreme hunger.

Complications During Coma

These fall under the headings of respiratory, cardiovascular, gastrointestinal, central nervous system, muscular and miscellaneous.

Respiratory:

Stertorous breathing due either to an unfavorable position of the tongue or head and sometimes tonicity of the throat musculature probably is most common under this heading. Pulmonary edema may develop in an alarming manner. Laryngeal spasm occasionally occurs and requires immediate termination of the hypoglycemic state. Cheyne-Stokes respiration or even cessation of breathing in the deep comas or following convulsions is not uncommon. Bronchospastic respiration is also encountered as well as irregularities in the respiratory rate and depth. Hiccoughs require only passing mention. Excessive cyanosis may be due to embarrassed respiration and is an indication for termination.

Cardiovascular:

The pulse may fluctuate in a most inconsistent manner and bradycardia is of frequent occurrence. Pulse quality within certain rate limits is most important. A rate above 140 or below 45 must be watched very closely and a decision reached concerning possible termination. Pallor is often a symptom of failing cardiac function. Auricular fibrillation has been experienced by patients in some clinics[2] and extra systoles or dropped beats are not uncommon. With proper selection, examination and care of patients, the incidence of cardiac collapse can be limited. Acute cardiac dilatation is prone to occur during the coma stage of hypoglycemia. Of the three fatalities in the first 104 treated cases at Vienna, one showed cardiac dilatation; this in a patient who had an unnoticed relapse at night.[3] The same finding was noted at autopsy in one of the author's cases in which the patient died during a prolonged coma.

Gastrointestinal:

Alkaline stomach contents are confusing when one depends upon the acid reaction with litmus for the location of the gavage tube. Vomiting, a most undesirable gastrointestinal complication because of the danger of aspiration, can be controlled in some cases by the use of atropin and occurs less frequently if breakfast is omitted. In the writer's experience, it occurs most often shortly after termination. Eructations usually are transient and cause no particu-

lar difficulty. The appearance of bile in its various forms and other gastrointestinal contents coming from the gavage tube is of no serious import.

Central Nervous System:

Fortunately many of the complications under this heading are only transient, lasting from a few minutes to a few days. Among those lasting for the shortest period of time are hypothermia, hyperthermia, convulsions which may be indicative of cerebral pathology if they occur in the late stages of coma, aphasia, strabismus, diplopia, monoplegia, paresis of the lower extremities and facial weakness.[4] Those lasting for a longer period of time or causing a fatal termination are: the prolonged coma which may be defined as a state of unconsciousness associated with hypoglycemia induced by the injection of insulin which fails to disappear when carbohydrate is administered intravenously in the usual amounts necessary to awaken the average patient; and possibly conditions associated with the prolonged coma, such as cerebral edema, cerebral and meningeal hyperemia.

Muscular:

The commonplace muscular phenomena which give no particular difficulty will not be considered as complications here. Tonic generalized muscular spasm is undesirable because it embarrasses the cardiorespiratory system and exhausts the patient. Muscle strain sometimes occurs during a convulsion.

Miscellaneous:

Injuries to various parts of the body may take place during the stage of excitement if the patient is not carefully watched or restrained. Severe clonic movements of the extremities develop during which the latter may strike the bed frame, causing contusions. The prevention of tongue biting should receive proper attention and the patient's bed must be properly placed so that he will not come in contact with steam pipes or radiators. If the patient is lying at the edge of the bed on his side while he is being gavaged, the gavage tube if not inserted its whole length may by its own weight pull itself out of the stomach unnoticed and some of the gavage fluid will enter the trachea. Frequent emptying of basins placed under gavage tubes and careful observation of the basin is

necessary to prevent inhalation of fluids escaping from the mouth or gavage tube. Care should also be exercised that there be no foreign bodies in the mouth preceding coma.

To the miscellaneous group may be added complications which are revealed at autopsy. Bryan[5] has reported liver atrophy and degeneration about the central veins in a woman who died several months after her treatment had been discontinued. The Vienna series of cases showed among other things acute pancreatic necrosis, dilatation of the heart, cerebral and meningeal hyperemia, lobar and lobular pneumonia, cerebral edema, coronary sclerosis and thrombosis, as well as other findings, of a minor nature. In our only case ending fatally, the gross pathology was cardiac dilatation, an enlarged lymphatic system and a persistent thymus gland. This woman had withstood a difficult labor several months before without alarming symptoms and in the opinion of the writer could have been treated successfully if a prolonged coma had not intervened.

Complications Following Coma

Perhaps the most common complication under this heading is the relapse which occurs anywhere from a few minutes to several hours following termination of the hypoglycemic state. The latest relapse in our experience developed at 9 p. m., approximately eight hours after the initial carbohydrate administration and it is my understanding that none occur later than 12 hours[6] after termination. Some patients will complain of abdominal cramps. In many instances constipation is experienced; however, in one of the author's cases a diarrhea developed. Convulsions which fail to disappear with the administration of glucose have been known to occur several hours after termination, ushering in a relapse. Cyanosis with abdominal rigidity developing in the afternoon has been reported[7] and muscular cramps or headaches occasionally annoy patients for several hours. One of my colleagues told me of a female patient whom he treated, whose facial hair seemed to become coarser and more prominent during insulin therapy. Glucose unintentionally injected outside the vein may cause considerable swelling and discomfort. Fifty per cent glucose used intravenously may occasionally cause thrombosis, but the 33 per cent va-

riety seldom does this. Ice bags applied to the involved areas control the situation satisfactorily. In the experience of the writer no sloughing has occurred as the result of the former complication. Lung abscess and aspiration pneumonia are not uncommon, but their incidence can be reduced to a minimum by constant and careful supervision. One should be satisfied that the patient is thoroughly awake before oral feeding is attempted. Persistence in coaxing a patient to drink carbohydrate solution after it has caused him to cough may lead to aspiration and its various complications. One of our female patients, a month after her treatment had been discontinued, developed an atypical lobar pneumonia, which eventually was proven to be tuberculous in character. This and other pulmonary complications have given the writer the impression that the respiratory system probably is more harshly affected during hypoglycemic therapy than are any of the other body systems. The urine will occasionally show a few red blood cells, finely granular or hyaline casts, a slight trace of albumin or some sugar which has been excreted through the kidneys, the sugar threshold apparently having been exceeded by the ingestion of large amounts of carbohydrates. Perspiration of a profuse nature occurring when no insulin had been administered was a complaint offered by one of the writer's patients.

Complications Occurring During and After Coma

All who have had experience with insulin therapy have had occasion to terminate the hypoglycemic state because of grand mal convulsions. When occurring early or in the middle of the day's treatment, they are not usually a serious complication. To the contrary, some physicians consider them beneficial and do nothing about them except to prevent the patient from biting his tongue or otherwise injuring himself. However, a convulsion in the late stages of the morning's treatment may mean changes in the nerve cells, of an undesirable character, and immediate termination is indicated.

Elevation of temperature occurs during or after coma. In the former instance, it is usually indicative of serious mischief in or near the temperature centers of the brain. In the latter, the same

may hold true or it may signalize an infectious process or possibly a reaction to intravenous glucose. Slight elevations of temperature, noninfectious in character, usually disappear by the next morning. The following case is presented to illustrate two of the complications mentioned occurring simultaneously: namely, hyperthermia and prolonged coma.

* * *

The patient was a woman 22 years of age who suffered an injury to her left eye at four years. Deformity resulted, marring the appearance of her face and creating considerable psychic trauma. Vision was lost in the involved eye. From a prepsychotic personality standpoint, she was described as jealous, unstable, irritable, sensitive and moody. Her psychosis began one month prior to admission at a time when her younger sister procured an illegal abortion. Subsequently she became hallucinated, preoccupied, resistive, assaultive, self-destructive, striking her abdomen and biting her legs, arms and shoulders. Her habits were untidy. Insulin therapy was given with the hope that she would be easier to manage on the ward. The official diagnosis was dementia præcox, hebephrenic type. Duration of hospital residence before insulin therapy was four years.

After receiving seven treatments, two of which produced comas with the dosage of insulin at 90 units, a rest period of about two and one-half weeks was given because the urine contained a few red blood cells, 1+ albumin and many pus cells. It was thought that she probably had a cystitis. Urotropin, grs. 10 t. i. d., was ordered and after two weeks the urine cleared sufficiently to again place her on insulin. After two days of treatment, on each of which she received 90 units, with the production of two comas, she was given her third dose at 8 a. m., the amount remaining the same. About 10:30 she showed the early signs of oncoming coma. At 12 noon shortly before the usual termination time, it was noted that the patient's body seemed very warm. Accordingly, immediate steps were taken to terminate the hypoglycemic state. A 30 per cent sucrose solution was given by gavage to the amount of 16 oz. supplemented by 200 c.c. of 33 per cent glucose intravenously and 1 c.c. of adrenalin 1:1,000 subcutaneously. However, these meas-

ures failed to revive her. Her respirations became stertorous in character, considerable cyanosis developed, and it appeared that she might have an early pulmonary edema. Atropin sulphate grs. 1/75 was administered and a lumbar puncture performed which showed clear colorless fluid, not under pressure. About 25 c.c. in all were obtained. Adrenalin hydrochloride, 1:1,000 strength, 1 c.c., was repeated about one hour after the initial dose and later when her pulse was of somewhat poorer quality, an additional ½ c.c. was given. Digitalin, grs. 1/50, every four hours was administered hypodermically. Her temperature went to 105.8° but this was controlled by means of ice bags to the head, neck and extremities, alcohol and ice water temperature sponges, and ice water rectal taps. She received individual nursing care at the insulin clinic and seemed to be slowly improving. While in the latter place, her generalized tonic spasms of the body musculature were sufficient to embarrass respirations and were accompanied by opisthotonos. The slightest external stimulus was sufficient to produce a paroxysm of generalized tonic spasm accompanied by stertorous breathing.

The following morning her temperature had subsided to 100.4°, with pulse about 100 and respirations about 30. In the afternoon her temperature became elevated to 102°, but her condition had improved sufficiently to permit her transfer to a sick ward. Mustard poultices were applied to the left chest in the infraclavicular region and infrascapular area, because of suspicious breath sounds indicating a possible early pneumonia. At times the patient would open her eyes and close them, or she would moan slightly and turn her head from side to side. On another occasion she changed her position in bed. However, at no time did she give evidence that she was in contact with her surroundings, nor did she talk. A hypodermoclysis consisting of 1,000 c.c. of saline with 75 c.c. of 50 per cent glucose included was administered on the morning of the second day of the prolonged coma and also in the afternoon. Her general condition at 8 o'clock in the evening seemed fairly good, although her temperature had become elevated to about 103°.

At 6 a. m. on the morning of the third day she developed a pul-

monary edema, her respirations going to 60 and temperature to 105.6°, with pulse 158 of fair quality. Accordingly, she was lowered over the edge of the bed and the respiratory passages drained. About a half cup of greyish, moderately thick fluid was obtained. Subsequently grs. 1/75 of atropin sulphate was given. Spinal fluid to the amount of about 25 c.c. was obtained with no increase of pressure apparent. A complete blood count showed 70 per cent hemoglobin, R. B. C. 3,520,000, color index 1, some macrocytes, lymphocytes 16 per cent, polynuclear neutrophiles 84 per cent, nonfilaments 48, W. B. C. 13,400. Glucose solution, 100 c.c. of a 50 per cent strength, was administered intravenously and seemed to be of material assistance in relieving the pulmonary edema. She was placed on her side and orders were left for her to be turned every 15 minutes. One-sixtieth of a grain of strychnine sulphate was added to the digitalin which was being administered every four hours. Hypodermoclyses were temporarily omitted until danger of further pulmonary edema disappeared, and the foot of the bed was elevated by means of high blocks to encourage drainage from the respiratory passages. Temperature sponges and ice bags were used to control the hyperthermia. On the afternoon of the first day of prolonged coma, a bilateral Babinski could be elicited. The deep reflexes, however, were not increased, the corneal reflexes were present and the right pupil was not dilated. On the third day of prolonged coma, no Babinski could be elicited, the corneals were still present and some fibrillary twitching of the face was noted involving both masseter muscles. There was no stiffness of the neck and no cranial nerve involvement could be observed. Voiding was satisfactory, no abdominal distention occurred and her color was fairly good. Her temperature on the fourth day ranged from 101° to 103°, with respirations about 30 and pulse in proportion. It was noted that when she lay on her right side respirations and temperature became elevated. A lumbar puncture performed showed no increase of spinal fluid pressure. When examined it showed 108 mgm. of sugar, negative globulin, 26+ cells and many red blood cells; the colloidal gold test was also negative. On the fourth day she seemed more alert and it was noted that on the preceding night she had begun to bite her hands and mutter a few

words which sounded like "No," "Nurse" and "It's awful." Her temperature registered 101.7°; pulse, 88; respirations, 24. She would open her eyes and occasionally stare at the nurse or physician, but gave no evidence of recognizing them. Her heart, lungs and abdomen were essentially negative. Blood pressure was 122/64. Neurological findings were as follows: The right plantar reflex was absent, knee and ankle jerks were equal but slightly increased (3+); right biceps jerk 3+, left 1; right elbow jerk 3+, left 2; abdominal reflexes absent; slight left facial weakness; no stiffness of the neck, nor Kernig. Pain sensation seemed intact as evidenced by the fact that the patient grimaced when either her leg or arm was pinched. It was perhaps more marked on the right side. She opened her eyes, looked about, but did not seem interested in anything. Incontinence of urine and feces complicated the picture. She was able to move all parts of her body, but could not swallow. Some of the retention enemas administered, consisting of physiological salt solution, q. s. oz. 6, containing 5 per cent of glucose were retained. On the fifth day she was given morning and afternoon feeding which was continued until she could eat by herself. On the sixth day the writer noted moderate spasticity of the body, more marked in the left upper extremity. By means of atropin sulphate solution, the right pupil was dilated, but the fundus was not remarkable. When asked a question at that time, the patient would look at the examiner and frown. Her father asked her if she would care to return home and she replied "No." On another occasion in the presence of the writer she yawned. On the seventh day there was a Babinski on the left side which appeared without the usual stimulation of the plantar surface. Blinking and tremulousness of the eyelids were also observed. Some redness of the buttocks, apparently the result of irritation from urine, was noted. On the eighth day the writer found that the right upper extremity could be partially flexed, but when the process was repeated, she seemed to offer resistance to the procedure and eventually held her arm stiffly. This was not so pronounced in the lower extremities. Spasticity remained greater on the left side and there was an abrasion under the chin due to the fact that she had rubbed her chin on the sheets. The plantar reflex was present on the left, but

absent on the right. Temperature, pulse and respirations were normal. She would not carry on a conversation and seldom talked, her general reaction simulating to some extent a catatonic stupor. However, she would not hold an extremity in one position and there was no Schnauzkrampf, muscular waxy rigidity or other symptoms presented by the average catatonic. In the writer's opinion, most of the phenomena described were explainable on an organic basis, although neurological findings, such as the spasticity, might be partially confused with voluntary resistance on the part of the patient.

On the sixteenth day the following note was made: "This patient has ceased talking and appears to be in a stuporous state. Rigidity of the extremities, particularly of the upper ones, which is more or less pronounced from day to day, still persists. She is now able to swallow small amounts of fluid. . . . An irregular coarse tremor of both hands, more marked on the left, noted October 10 (the eleventh day of her illness), disappeared the next day. Its appearance was functional in character . . . On October 11, it was noticed that she frequently drew her knees up off the bed. Blinking of the eyelids persisted. On October 13, some ankle clonus was present on the left and both plantar reflexes were in evidence. It appeared that the abdominal reflexes were slowly returning. The response, however, was noted well back on the flanks. The left facial weakness had almost entirely disappeared. Knee jerks, about 4+, were quite brisk but equal. There was no stiffness of the neck nor Kernig sign. The right pupil reacted to light. Tube feeding was continued. A repetition of the spinal fluid examination was continued. A repetition of the spinal fluid examination was ordered. October 22, 1937: "Sitting up; eating soft solids." November 6, 1937: "Assaultive; incoherent."

At present (April 18, 1937) she is agreeable and cooperative. Her sadistic symptoms have disappeared: the one great improvement as the result of hypoglycemic therapy. However, considerable mental deterioration is present.

The complications mentioned in this paper are probably not all inclusive, but represent for the most part the difficulties encountered when insulin is employed in the treatment of the psychoses.

Careful selection and pretreatment examination, together with competent, constant medical and nursing supervision, will eliminate most of them. There are few which cannot be avoided.

REFERENCES

1. Meade, J. R.: Insulin in the treatment of schizophrenia. Minnesota Medicine, 20:373, June, 1937.
2. Schatner, M., and O'Neil, F. J.: Some observations in the treatment of dementia præcox with hypoglycemia. PSYCHIATRIC QUARTERLY, Vol. 12, No. 1, Jan., 1938, p. 11.
3. Wilson, I. G. H.: Study of the Hypoglycemic Shock Treatment in Schiophrenia. His Majesty's Stationary Office, London, p. 28.
4. Schatner, M., and O'Neil, F. J.: Loc. cit.
5. Bryan, L. L.: Insulin hypoglycemic shock treatment in dementia præcox. Bulletin of the Utica Academy of Medicine, Vol. 3, No. 4, April, 1938.
6. Wortis, J., and Roberts, J.: Insulin shock in the psychoses. American Journal of Nursing, Vol. 37, No. 5, May, 1937, p. 497.
7. Blalock, J. R.: Discussion at the Harlem Valley State Hospital insulin conference, Nov., 1937.

SERIOUS COMPLICATIONS OF INSULIN SHOCK THERAPY

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Insulin when administered in sufficiently large doses to produce shock so alters and influences body metabolism as to produce serious clinical complications. To those who are engaged in this work such complications offered a chance to study clinically, at least, physiological processes that have not previously been observed when the patient was under the influence of insulin. In the treatment of diabetes mellitus, the action of the drug is so well controlled by carbohydrate intake that untoward pharmacological reactions are seldom observed. The new method of treatment of dementia præcox has opened up a wide field for the observation of the action of the drug, insulin.

The writer in his undergraduate and early clinical experience was often warned of the dire results which might follow the overadministration of this drug to the patient in diabetic coma. These warnings were apparently founded erroneously upon incomplete clinical observations. We have found that the human body is capable of handling tremendous doses of insulin successfully.

Patients will usually remain in a profound state of shock for several hours after the administration of large doses of insulin, without serious results. Most of the patients will accept this regime repeatedly. Occasionally, a patient is encountered who will react unfavorably. We have observed one patient who received a total of 15, 430 units of insulin over a period of six weeks; the maximum amount administered at any one time was 400 units. She had a total of 484 hours of hypoglycemia; in spite of this tremendous dosage, the patient was never comatose, and showed few signs of hypoglycemic reaction. At the termination of the treatment the patient's physiological processes were apparently unaltered. On the contrary, other patients had been observed to go into a profound coma after the administration of 15 units of the drug.

Minor complications in insulin therapy are observed almost daily. Such occurrences are, on the whole, usually managed easily. It is surprising considering the amount of the drug given, the

length of the coma, and the repetition of treatment that serious complications are not much more frequent. The clinician when visiting the insulin ward is astonished by the physical state of the patients undergoing treatment. We know from experience that in order to produce favorable results in the schizophrenic patient it is necessary to approach, or even reach the point of serious physiological derangement. The writer has not made sufficient detailed studies by laboratory methods to discuss intelligently the profound changes which occur in body metabolism under the influence of insulin. He has, however, observed a rather interesting series of serious complications resulting from the use of insulin in the treatment of dementia præcox. In this paper it is not intended to discuss the more minor complications. The discussion will be confined to those complications which have resulted in grave somatic disease. For the sake of clarity the author has divided the conditions observed into the following categories:

1. Pulmonary complications.
2. Cardiac complications.
3. Serious damage to the central nervous system.

At the Central Islip State Hospital we have treated more than one hundred cases; eight of these patients have, during the course of treatment, developed pathological conditions of importance. There have been three deaths, with one postmortem examination.

Pulmonary complications were observed most frequently, and were the cause of death in two of the fatal cases. There were four cases of pneumonia, and two cases of lung abscess, incident to insulin therapy.

It is believed that a brief discussion of these may aid in a better understanding of the causative factors, and may provoke comments which will assist in the future avoidance of such complications.

Case Material

Case 1. I. G. White, female, age 31; diagnosis dementia præcox, paranoid type; duration six years. This patients received 29 injections of insulin, and had 16 comas. Her treatment was interrupted when she showed signs of an acute infectious process, characterized by high afternoon temperature, often reaching 105°, non-

productive cough, and signs of toxemia. Physical findings and X-ray examination confirmed the diagnosis of abscess of the lower lobe of the right lung. The condition was first observed on November 12, 1937. At the present time there is evidence of some healing of the abscess cavity. Her physical condition has improved, although she continues to run an afternoon temperature. Her mental condition has shown no apparent change. On several occasions while receiving treatment this patient showed respiratory distress. At no time, however, was there definite evidence of aspiration, either of saliva or sugar solution. During the course of her physical illness, cough has not been sufficiently productive to secure a good specimen for laboratory examination. In spite of the location of the abscess in the lower lobe, and the absence of evidence of involvement of other areas, a tuberculous process cannot be ruled out. The course of her illness is much more suggestive of an acid-fast infection than of the typical pulmonary abscess. As there was no evidence of lung disease on repeated physical examination prior to treatment, this condition must be attributed, indirectly at least, to the treatment.

Case 2. L. T. White, male, age 25; diagnosis dementia præcox, hebephrenic type; duration over four years. This patient's treatment was started on November 8, 1937. He received a total of 40 injections with a maximum dosage of 38 units of insulin. Thirty comas were achieved, and the patient had four convulsive seizures. The only outstanding feature of this case is that the patient usually failed to regain consciousness after nasal tube-feeding, and frequently required intravenous glucose. During the course of his treatment there was no evidence of aspiration, although he usually salivated and perspired profusely. Pulmonary edema was never observed. After having received 40 injections, the patient began to run a low grade temperature, fluctuating between 100° and 103°. After a few days observation in bed he was found to have developed consolidation of the left lower lobe. Following this the temperature became markedly elevated, respiration was embarrassed, and he ran a typical course of lobar pneumonia. The X-ray examination revealed an area of consolidation occuping about one-third of the lower portion of the left lung field. Three weeks after

the onset of this illness he became afebrile and has continued to improve physically since that time. The blood culture has been negative pneumococcus was present in the sputum. At the present time this patient has completely recovered from his physical illness, and has made a good mental readjustment.

Case 3. S. S. White, female, age 34; diagnosis dementia præcox, paranoid type; duration over three years. Her treatment was started on March 9, 1937. She had a total of 31 injections, achieved 16 deep comas, and had a maximum dosage of 85 units of insulin. Under treatment the patient made a remarkable remission from her mental symptoms. Her progress under treatment was uneventful until the thirty-first day when she received her usual shock dose. Three hours after the injection while semicomatose, she showed respiratory difficulty with cyanosis. Tube-feeding was administered; however, coma deepened and the patient required intravenous glucose. After regaining consciousness, she had a distinct chill, and her temperature rose rapidly to 103.4°. For the next three weeks the patient ran an irregularly elevated temperature, which seldom went above 103°. She complained of pain in the left lower chest, but had a persistent nonproductive cough. X-ray revealed consolidation of the left lower lobe. The course of her physical illness was uneventful. The white cell and polynuclear count were moderately elevated; sputum was repeatedly negative for tubercle bacilli. During the third week of the illness her temperature gradually fell to normal, following which she recovered uneventfully. At the time of her discharge from the hospital six weeks later, she was free of physical symptoms, and has remained so. This is evidently a case of aspiration pneumonia which did not proceed to abscess formation.

Case 4. J. C. White, male, aged 36; hospital residence over four years; diagnosis dementia præcox, paranoid type. Insulin therapy was started on September 3, 1937. Subsequently he received a total of 22 injections, with 12 comas. The maximum dose was 155 units. The treatment was progressing satisfactorily until the day of the twenty-second injection when he was tube-fed after four hours of hypoglycemia. Shortly after the tube was withdrawn he regurgitated, apparently aspirated some of the solution,

became cyanotic and showed respiratory distress. The patient developed physical signs of a pneumonitis of the middle and lower lobes of the right lung. This was complicated on the third day by a massive empyema. Pneumococcus was never found in the sputum, but type 2 organism was isolated from the empyemic fluid. He ran the typical course of lobar pneumonia, complicated by empyema. The temperature was extremely high. The blood count was characteristic of a fulminating infection. The patient died on the sixth day of the disease at the time of crisis. A postmortem examination was refused. It was obvious in this case that the onset of the pulmonary disease very definitely resulted from aspiration.

Case 5. F. B. White, male, age 28; diagnosis dementia præcox, paranoid type. Less than one year duration. The patient's insulin therapy was started on September 28, 1937. He had a total of 38 hypoglycemic states with 26 comas. The maximum dosage was 115 units. The patient showed no adverse symptoms during coma, except for weakening of pulse and considerable increase in perspiration and salivation. On the thirty-eighth treatment day he received 90 units of insulin. Two hours and 45 minutes later he had a severe convulsive seizure. The hypoglycemia was terminated immediately by nasal tube-feeding and intravenous glucose. The patient rallied immediately, but soon began to cough up frothy sputum and showed marked respiratory distress with cyanosis. Three hours later the patient had three distinct chills, followed by rise in temperature. Examination of the chest at that time revealed scattered, moist rales over both lung fields. On the following morning he complained of pain in the left lower chest, and nonproductive cough. At that time there was evidence of consolidation of the left lower lobe. This diagnosis was substantiated by X-ray examination. The patient had apparently developed a pneumonia following aspiration during the convulsive seizure. He underwent the typical course of lobar pneumonia of great virulence. Type 23 pneumococcus was isolated from the sputum. As no serum was available, treatment was symptomatic. The temperature remained excessively high, and the patient's condition rapidly grew worse. The blood culture was repeatedly negative. He died on the seventh day. Postmortem examination was refused.

Case 6. J. R. White, male, age 33; diagnosis dementia præcox, paranoid type. Duration six and one-half years. This man's insulin therapy was begun on January 18, 1938. He had a total of 30 injections with a maximum dosage of 200 units of insulin. During the course of treatment he had 17 comas and 1 convulsive siezure. While under the influence of insulin this patient frequently demonstrated the signs usually associated with decerebrate rigidity. On several occasions he failed to respond following nasal tube-feeding, and required intravenous glucose. On February 23, 1938, he received his thirtieth injection, consisting of 200 units. On that day he failed to go into coma, was restless, noisy, and showed considerable muscular twitching. The hypoglycemia was interrupted after five hours by nasal tube-feeding, and the patient awoke spontaneously in a short time. On the following morning he complained of severe abdominal pain and had a mild fever. The patient did not appear to be acutely ill. However, the abdomen was quite rigid. His treatment was discontinued. During the next few days he continued to complain of abdominal pain, and the temperature fluctuated between normal and 103°. Three days after the interruption of treatment he showed evidence of consolidation of the right lower lobe of the lung. At that time his white blood count was 17,300, polynuclear count 85 per cent. At that time the patient appeared to be acutely ill, temperature was high, pulse rapid, respirations increased. An X-ray of the chest revealed a pneumonitis of the right lower lobe. Blood culture was negative. At the time of writing this patient is still acutely ill; his disease has been running a very stormy course. The temperature has continued elevated. Six days after the first evidence of consolidation, pus was aspirated from the right chest. This showed a mixed infection, including cocci, nonhemolytic streptococci and fusiform bacilli. Repeated aspirations of the chest have been required, and on each occasion a foul-smelling pus has been obtained. It is felt that this patient probably aspirated saliva, subsequent to which he developed pneumonitis with later abscess formation. The abscess had apparently ruptured into the plural cavity, causing empyema.

Case 7. F. B. White, female, age 26; diagnosis dementia præcox, paranoid type. Duration three and one-half years. This patient was previously described on page 15 in the PSYCHIATRIC QUARTERLY of January, 1938. I refer to this case again because it is the only serious cardiac complication which we have observed. At the time of treatment she showed evidence of endocrine disturbance. Because of her poor physical condition she was treated cautiously. On the seventh day of treatment, when she received 60 units of insulin, she developed cardiac collapse one-half hour after the onset of coma. The patient remained unconscious for four and one-half hours, during which the pulse was extremely weak and rapid, and on one occasion she was pulseless for a brief interval. Intravenous glucose and cardiac stimulant were administered, with the result that the patient made a complete physical recovery, and had apparently returned to normal at the end of two and one-half hours.

Case 8. A. L. White, female, age 44; diagnosis dementia præcox, paranoid type; duration over three years. This is a case of prolonged coma of almost 11 days duration, terminating in death, with postmortem examination. She was previously admitted to the hospital on April 5, 1935, and discharged January 7, 1936. She was readmitted on October 8, 1937. Her insulin treatment started on January 27, 1938, with 20 units of insulin. When the third injection, consisting of 50 units, was administered, the patient achieved her first coma, uneventfully. On the fourth day of treatment this dose was repeated at 7 a. m., and she went into coma at 9:50 a. m. At 11 o'clock (four hours after injection) the hypoglycemic state was interrupted, but the patient failed to awaken and required intravenous glucose. That night she was somewhat disturbed, and was given paraldehyde as a sedative. On the following day she received her fifth injection, consisting of 50 units at 7:20 a. m., and was in coma at 9:50. She showed normal hypoglycemic reaction until 10:30 a. m., when her pulse rate dropped suddenly from 100 to 54. At that time the patient was in deep coma with complete abolition of all deep reflexes. At 11 o'clock the pulse rate was 56, and was very irregular. The patient was immediately given sucrose by nasal tube. However, she failed to respond and

45 minutes later was given 100 c.c. of 33 per cent glucose intravenously with no apparent change. From this time on the patient remained in profound stupor until her death, 10 days and 20 hours later.

Immediately after the onset of the stupor she was given large amounts of intravenous glucose, together with subcutaneous adrenalin, coramine and digalin. Throughout that day and part of the next she showed alternating contraction and relaxation of the voluntary muscles with synchronous movements of the eyeballs. The temperature gradually rose to 104°. The deep reflexes were hyperactive and Babinski sign was present. On the following day the muscular spasm disappeared, and the deep reflexes were lost. Muscular hypotonicity, with greatly diminished deep reflexes was present until the patient's death. She would occasionally respond very slightly to painful stimuli by a low groan or slight movement of the facial muscles. The corneal reflexes were preserved. The pupils were regular and responded to light. No abnormality could be discovered in the eyegrounds. The systolic blood pressure fluctuated considerably between 148 on the day of onset to 92 shortly before her death. Twenty-four hours after the onset of coma the blood sugar was 125 mgm. per cent. The spinal fluid pressure varied between 12 and 18 mm. of mercury; spinal fluid sugar was 120 mgm. per cent. Blood chloride (as sodium chloride) was 427 mgm. per cent, spinal fluid chloride 770 mgm. per cent. Throughout her illness the patient's temperature fluctuated considerably. During the first five days it remained above 104° almost constantly. It then fell to about 102° and continued near this level until shortly before her demise, when it reached 107° per rectum. Pulse and respirations were always greatly increased. Diaphoresis was quite marked throughout. Repeated urinalysis usually revealed the presence of albumen, a few white and red blood cells, and occasional casts.. A 3 or 4 per cent urinary sugar was reported on each specimen, several of which also showed acetone.

Every conceivable method of treatment was used. Cardiac and respiratory stimulants were administered in large doses. Atropine, coramine, adrenalin and digalin were employed. Shortly after the onset, believing that the condition might be the result

of cerebral edema, spinal drainage, caffeine by hypodermic, and saturated solution of magnesium sulphate by rectum were used in an effort to promote dehydration. This was continued for 24 hours, and was followed by an adverse change in the patient's condition. After this experience it was felt advisable to treat the patient by supportive measures. The fluid intake was maintained between 2,000 and 3,000 c.c. per day by intravenous infusion, hypodermoclysis, and tube-feeding. Hyperpyrexia was combated by cold packs and alcohol sponges. Retention of urine and feces required appropriate measures. On several occasions the patient was given 75 c.c. of 33 per cent glucose, with 30 units of insulin intravenously. On one occasion 1,000 international units of crystalline vitamin B_1, was given intravenously, with no response. Blood chemistry examinations were repeated frequently. The blood sugar varied between 111 and 133 mgm. per cent. Urea nitrogen remained in the neighborhood of 16 mgm. per cent. In spite of the various methods of treatment employed, the patient remained in a profound stupor and died almost 11 days after the onset, without regaining consciousness. A few minutes after death, 20 per cent formalin was injected into the subarachnoid space by the cisternal and orbital routes to prevent disintegration of the brain. Fifty-one hours after death a postmortem examination was performed by Dr. Trygstad. The essentials of the gross pathology are as follows:

The spinal cord in the upper thoracic region showed a fine coating of partly hemolyzed serum on the posterior aspect.

The dura appeared normal. The pia was slightly more dense and hazy than normal. The cerebral convexities showed marked atrophy, partly focal, characterized by depressions; and partly more diffused as suggested by the increase in depth and width of the sulci.

The lungs showed hypostatic congestion and low grade bronchitis. The heart showed a slight sclerosis of the aortic valve. There were several patches of subendocardial petechiae under the mitral valve on the wall of the left ventricle. A slight coronary sclerosis was noted.

The liver and kidneys showed slight degenerative change. There was no definite gross pathological change in the pancreas. The adrenals were larger than normal and showed a marked congestion of the medullae.

The microscopic examination of the organs has not been completed. They have been submitted to Dr. Ferraro, who is making a detailed study of them.

Conclusions

1. In more than one hundred cases of dementia præcox treated with insulin the writer has observed eight serious complications. There were six cases of pneumonitis or lung abscess. These pulmonary complications have all been of rather serious nature and resulted in two deaths. The occurrence of pulmonary edema, or the aspiration of saliva, vomitus or sugar solution, may account for the frequency of pulmonary complications. The writer wishes to draw attention to the frequency of the pulmonary complications.

2. On numerous occasions during our experience with insulin shock therapy we have observed the occurrence of pulmonary edema. This phenomenon is possibly the result of increased bronchial secretion, rather than of cardiac decompensation. In all the cases in which it did occur, there was no evidence of cardiac insufficiency. These patients usually showed a marked increase of perspiration and salivation previous to the development of pulmonary edema.

3. A case of cardiac collapse under insulin therapy has been reported.

4. The clinical description and gross pathological findings in a case of prolonged coma following administration of insulin has been discussed. It is hoped that the detailed study of the specimens obtained in this case may contribute something to our knowledge of the physiological action of insulin when given in large doses.

5. The importance of the serious complications of insulin ther-

apy cannot be overstressed. In the past insufficient attention has been given to this phase of the new therapy. Considering the amount of insulin administered and the repetition of the treatment, it is remarkable that complications have not been more frequent. The writer hopes that more serious consideration will be given to the factors complicating the treatment so that means of preventing these catastrophies may be found.

PROTRACTED COMAS OCCURRING DURING INSULIN HYPOGLYCEMIC THERAPY

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As experience accumulates, it has become apparent that infrequently, although there has been no modification in the treatment procedure, a patient who has been responding normally by awakening from 15 to 30 minutes after receiving a sufficient quantity of sugar, fails to do so but instead remains in a deep protracted comatose state from 8 to 48 hours and even longer. Following this the patient may continue in a stuporous state of varying depth from several days to a few weeks. According to the literature some of these cases have terminated fatally.

Reports from workers in various parts of the world describing these occurrences indicate that it is not a fault in the technique that at present could be prevented but that some unknown factors are operative. When one considers that since October, 1936, we have treated approximately 95 patients, involving 4,000 individual treatments, and that protracted comatose states have occurred on only several occasions, one sees the infrequency of this complication. It is possible that milder stuporous states occur with greater frequency but are not yet reported. It is also possible that several of the deaths which have occurred in various hospitals are the aftermaths of these protracted comatose states.

In the European literature, a few such occurrences have been reported, two with pathological findings.

From a survey of the cases reported, as well as our own experience, the following facts seem noteworthy. First, that if such a comatose state supervenes in the course of therapy, it usually occurs early in the treatment or during the first few comatose states; second, that the dosage of insulin is comparatively low, in most cases between 50 and 80 units (a few exceptions); third, that if the patient survives, the incident is usually followed by corresponding improvement or recovery of that patient; fourth, there is little correlation with the blood sugar level.

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A few attempts at explanation have been made. Easton[1] reported one case in a 29-year-old patient who developed a protracted comatose state lasting 48 hours and then went on to physical and mental recovery. His explanation was that the patient was a type unduly sensitive to insulin and the reaction was one of insulin toxicity. Maloney and Honan[2] mention a case of 11 years duration in which the patient was comatose and stuporous for several days. They found high blood and spinal fluid sugar values during coma and ascribed the recovery to antidiabetic treatment. This interpretation seems questionable since they had previously given the patient large doses of glucose (orally and intravenously) and the course did not differ essentially from that of several others who had not received antidiabetic treatment but who recovered spontaneously.

Salm[3] was the first to call attention to the occurrence of these unusual states, reporting four cases, three of which recovered. In the fourth case which came to autopsy, Salm stated that the continued coma could not be ascribed to hypoglycemia. He felt that it was due to circulatory disturbances which gave rise to cerebral lesions as a result of local disturbances in the brain cells. Small hemorrhages were found in the region of the third ventricle, substantia nigra and in the vegetative centers which regulate sleep, temperature, circulation, blood pressure and sweating. He considered the confused states and continued somnolence as due to these disturbances in the midbrain and comparable to the clinical picture of epidemic encephalitis.

In 1937, Kraulis[4] also reported the occurrence of five cases with recovery from protracted coma and one fatal case in which autopsy was denied. Of the five patients who lived, four went on to mental recovery although previously they had been treated in the usual way without improvement. The one case without improvement was advanced and of 10 years duration. From this experience he concluded that these prolonged comas were of therapeutic value and then sought to induce them where the usual insulin and metrazol therapy seemed to be failing. He did this by giving sufficient insulin to produce deep coma within three hours. Then a stomach tube was passed and 10 or 15 grams of glucose was given, which

was repeated at one or two-hour intervals. The aim was to administer sufficient sugar to maintain the nutrition of the cerebral cells, but not enough to awaken the patient. In this manner Kraulis has been able to keep patients in a fairly deep coma for 12 hours or longer. Six patients were thus treated with artificial coma. After a few protracted shocks, four improved sufficiently to be discharged and two remained unchanged. Kraulis suggested that if this method produces no more fatalities than hitherto, even early cases might thus be treated to shorten the term of therapy.

Leppien and Peters[5] recently reported an unusual case, that of an 18-year-old patient with catatonic dementia præcox, who had been ill less than one year, in whom protracted coma and death occurred with a maximum dose of only 25 units. At the fourth treatment, when he was given 25 units, there was a slight convulsion and the next few days the patient appeared sick, with slight fever and vomiting. Treatment was withheld for five days. On the sixth day, he was given 15 units; he vomited in the evening and treatment was again withheld. Two days later 15 units and the following day 20 units were given. Towards evening he began to have right-sided Jacksonian seizures which continued for two days. His general condition became worse and a day before his death he had additional Jacksonian attacks, now on his left side, with mild paralysis of the right side. The temperature rose to 104°, he grew weaker and death occurred five days after the last injection of 20 units of insulin. At autopsy, the meningeal vessels were heavily injected and over the left cerebellar hemisphere a subpial hemorrhage the size of a small coin was found. Microscopically the brain was hyperemic, showed perivascular infiltrations with diffuse destruction of the ganglion cells at the occipital, frontal and especially the parietal areas. The individual cells were swollen with a pale, homogeneous appearance and a loss of the tigroid substance. There were large areas of paling of the ganglion cells, especially in the third cortical layer. The nuclei showed no real change in appearance but the cell outlines were not sharp and occasional shadow cells were seen. Similar swollen appearances were found in the large cells of the corpus striatum, olive, dentate nucleus, and in the nuclei of the ninth, tenth and eleventh cranial

nerves. The nuclei of the cells of Ammon's horn were shrunken and stained deep, which the author attributed to beginning ischemic changes. The Purkinje cells of the cerebellum were also moderately swollen and a few showed shadow forms. In areas where there seemed to be most destruction, there was hyperplasia of the glial elements.

The other instances of death after protracted coma do not have detailed pathological reports but show hyperemia of the brain and meninges (Berglos and Susic, Dussek and Sakel) but apparently were reported before the histologic studies were completed.

Of the first 1,039 cases treated in the New York State hospital system, there were 13 deaths. Five of the brains are being studied by our neuropathological department. Though this study is incomplete, Dr. Ferraro[6] has permitted the authors to state that it is his impression that there are definite cellular pathological changes related to an ischemic factor. The ischemia is considered to arise from what might be called a diffuse progressive endarteritis. The endarteritis is represented by considerable proliferation of the endothelial cells of the intima. Rather than endarteritis, one should really speak of "endarteropathy" because of the complete absence of any inflammatory reaction surrounding the blood vessels. The Ammon's horn and the temporal lobe seem most involved and in Ammon's horn there is considerable fatty degeneration of the nerve cells.

The findings hitherto reported of cases in which death occurred after long coma generally conform to those that have been produced in nonschizophrenics who have had insulin shock, as well as in experimental animals where the hypoglycemic states have purposely and repeatedly been produced.

From animal experimentation, it has been known that the hypoglycemia itself is not responsible for the prolonged continuance of the coma. Sherrill and MacKay[7] working on dogs have shown that when a state of insulin shock has been maintained for approximately 24 hours or less, irreversible changes occur so that it is impossible to resuscitate the animal and death always ensues even though in the interval the blood sugar has long since returned to normal. There has been disagreement whether there is damage

to nerve tissues after repeated insulin doses. The majority opinion seems to be that in nonschizophrenic cases, as tumors of the pancreas with hypoglycemic states, similar findings to those reported above occur. These include a diffuse involvement of the nerve cells of all the cortical layers, especially laminae 3 and 5, with paling of the entire cell, little or no Nissl granulation, the cells frequently fragmented, shrunken and occasionally infiltrated with fat droplets. In addition, swelling of the axis cylinders, glial proliferation and moderate perivascular round cell infiltration were noted. Numerous small petechial hemorrhages have been reported by Wolhill[8], Teerbruegge[9], Bodecthal[10] and others.

Bodecthal reported the case of a diabetic whose hypoglycemic coma was mistaken for diabetic coma and who received large amounts of insulin. DeMorsier and Mozer[11] reported the case of a morphine addict who gave himself 100 units of insulin daily, and entered a coma of three days duration before his death. In these cases the findings were similar to those above.

Stief and Tokay[12] produced daily hypoglycemic symptoms in dogs for a period of 11 to 31 days by injecting 24 to 100 units of insulin and found marked involvement of the cortex and corpus striatum. They also carried out experiments with intrasternal and intracerebral injections of insulin and claimed to have produced similar but more marked effects. They believed the pathology is produced by angiospasm of the cerebral vessels.

In acute experiments Schereschewsky,[13] et al, gave up to 500 units to dogs and found pericapillary hemorrhages, vacuolation and shadow cells. Tanni[14] produced acute and chronic changes in rabbits: diffuse degenerative changes in ganglion cells, glial proliferation, sclerosis of the cornu ammoni and softening in the substantia nigra.

Grayzel[15] found that rabbits which had the most convulsions and the most prolonged shock states showed the greatest cerebral damage.

Weil,[16] experimenting with rabbits, found that small doses produced no histopathological findings. With a total of 70 to 150 units for 10 days mild changes were produced, while severe alterations were found with doses of 200 to 400 units over the same

period. He considered the cellular pathology to be the result of anoxemia, not the anoxemia resulting from vascular occlusion but rather an inability to utilize the oxygen in the presence of large doses of insulin. He is of the opinion that the histologic picture does not lend itself to the theory of spasm of vessels, stasis or thrombosis but fits in with the view of Holmes,[17] Damashek, Myerson and Stephenson[18] that insulin in large doses interferes with the utilization of oxygen by the gray matter of the brain, that is, an intracellular anoxemia. The latter investigators have shown that the uptake of oxygen in humans (as measured by brachial-jugular differences in oxygen content) becomes most reduced during the most severe reactions. In slight hypoglycemic states it is about 11 per cent less, in moderate ones 16 per cent less, while in the severely reacting ones it is about 37 per cent less. The writers preferred to interpret this as due to a decreased oxygen utilization by the brain.

Gildea and Cobb[19] produced lesions which were similar to the lesions produced with hypoglycemic coma by ligating the carotid and vertebral arteries of cats. They found that after 10 or 15 minutes of complete anoxemia (if the animal lives 24 hours or longer) this resulted in areas of focal ischemic necrosis with diffuse cellular involvement. Courville[20] found the same changes in man following anoxemia with NO_2—0—where defective apparatus resulted in a shortage of O_2.

Case Reports

With these observations in mind, of the functional disturbances as well as the structural changes that occur in the central nervous system during severe hypoglycemia, we wish to report three cases of protracted coma.

Case I. The first case is that of a 25-year-old woman who five months before treatment showed marked psychotic symptoms of a progressive nature finally incapacitating her for work. She remained at home, fearful of people, of being talked about and of being the object of harm. Insulin therapy was begun on July 26, 1937. Four days later after receiving 40 units, she was stuporous and for the first time was not able to drink the glucose. The next

day, during the fifth treatment, with 50 units, she became comatose at 10 a. m. and failed to respond to glucose one hour later. This was repeated several times and about 1 p. m., after being in coma three hours, she received 1 c.c. of adrenalin. Immediately she reacted with a generalized tremor; she responeded to touch with convulsive movements of a dystonic nature with striatal position of the limbs and classical Magnus DeKleijn reflexes; bilateral signs of pyramidal tract involvement were elicited, and the comatose state seemed to increase. Subsequent administration of intravenous glucose brought about no change and convulsions continued until late afternoon. Lumbar puncture showed clear fluid, normal findings. Temperature rose to 102°, pulse varied between 100 and 120. Spasmodic seizures continued during the evening and she remained in a semicomatose state for about twenty-four hours. She was mute, unresponsive to questioning and had retention of urine. The next day she was drowsy and confused but occasionally recognized familiar persons. Her physical condition rapidly improved but with this there was a return of her former delusional ideas. After five days, it was possible to resume insulin therapy, and although she continued with about 45 further treatments, a total of 52, there was no improvement in her mental condition. This is then a patient who developed a protracted coma after the fifth treatment with 50 units, recovered from this but returned to her former mental condition and did not improve with subsequent treatments.

Case II. The second patient, a 34-year-old male, had been ill for about five months prior to insulin therapy. On August 3, 1937, he received his first treatment, 20 units of insulin. This was increased rapidly so that by the fourth treatment at 80 units, he had a light coma. The next day on 85 units he was deeply comatose and remained drowsy for about three hours. The following day, the sixth treatment and third coma, the insulin had been reduced to 75 units, but he failed to respond to oral and intravenous glucose after being in coma one and one-half hours. After four hours, five minims of adrenalin was given. A convulsion followed; he remained in coma. Within another hour, 40 grams of glucose intravenously followed by 1 c.c. of adrenalin was given.

A series of convulsions of an extrapyramidal nature ensued immediately. Temperature rose to 106.6°, pulse continued rapid, at times almost imperceptible, and respirations were rapid and shallow. There was marked cyanosis. Convulsive movements continued in the later afternoon and terminated after intravenous sodium amytal. Bilateral Babinski sign was present for 24 hours and the patient did not seem to move his left arm freely. Blood sugar was 295 and CO_2 was 22 volumes per cent. Urine showed much sugar, no acetone nor diacetic acid. The acute temperature rise to 106 fell to 100 in 12 hours but for the next 12 days varied between 99 and 102. The day following the onset of coma he did not respond to stimulation, tossed and rolled restlessly and there was lack of sphincter control. Lumbar puncture revealed clear fluid, normal pressure.

His physical condition was critical for five days. Pathological reflexes disappeared after the first 24 hours but thereafter the patient remained incontinent and was unable to swallow food, although occasionally he could take a small amount of fluid. After about two weeks, the patient opened his eyes and seemed to recognize some factors in his environment. He began to cooperate to some degree and asked for a drink. He continued to have watery stools and was incontinent. He slept or was drowsy most of the time for a month after the onset of the comatose state and required complete nursing care. As his physical condition improved and his speech returned, marked echolalia and echopraxia were observed. His responses were extremely inconsistent and there was a high degree of perseveration. He was disoriented for time, place and person, confabulating tales of having left the hospital and visited other places. This period of confusion and disorientation continued until the end of the second month following coma but he remained expansive and grandiose for another month. At this time he was able to dress and feed himself with some facility. At the end of the third month he suddenly became surly, negativistic, stood motionless with his eyes closed, his hands hanging limply at his sides, and did not talk. His limbs could be placed in any bizarre position, which would be retained for long periods. He continued in this state of catatonic stupor for about two days when

it completely disappeared. Thereafter the patient was again euphoric, jovial, continued to tell phantastic stories but was able to consider his former beliefs erroneous. In reviewing this comatose state, a possible causative factor was the too rapid increase in the insulin doses administered. After regaining consciousness, the patient showed a clinical picture usually associated with organic brain disturbances, that is, the Korsakow syndrome. This in turn was followed by a two-day catatonic episode. Then he gradually showed progressive clinical improvement without further insulin treatment until by the end of the sixth month after coma he was discharged as recovered.

Case III. The third case is that of an 8-year-old boy who had two major convulsive seizures within six months prior to admission, in addition to various behavior disorders extending over a five-year period. Insulin therapy was begun on October 26, with 10 units and increased five units daily. He did not reach a comatose state for about six weeks until on December 10, with 125 units, he was unconscious for five minutes. The next day there was no unconscious state on the same dose. With the next treatment on December 13, again a dose of 125 units, the patient became comatose late during treatment. He had a generalized convulsion and failed to respond to glucose orally and intravenously. He was given Betalin S 1 mgm. but continued in a stuporous state, responding to painful stimuli in a crying manner and did not reply to questions. Temperature rose to 101.8°. By 6 p. m. (after about eleven hours) the patient was crying "Mama," otherwise speech was dysarthric. He seemed confused and misidentified nurses. By 7:30 his speech was more distinct but still disturbed and he now seemed to recognize the physician. He slept well that night and except for worn appearance and slight nausea, seemed his usual self. After a few days, treatment was resumed, during which several convulsive seizures and repeated comatose states occurred but with no unusual reaction. At present writing the mental picture has not changed. It is of note that although the child, prior to insulin treatment, had had spontaneous epileptic seizures, he was no more sensitive in his convulsive responses than are nonepileptic children to insulin.

Below in Table 1 are summarized those cases of protracted coma reported in the literature:

TABLE 1. CASES OF PROTRACTED COMA

Author	Age	Number of treatments	Number of comas	Doses	Result
Leppien and Peters	18	4	1	25	Died
Easton	29	14	4	76	Rec.
Salm	46	4	1	60	Rec.
	42	..	2	50	Rec.*
	..	..	2	..	Rec.
	22	8	3	80	Died
Malony and Honan	36	22	11	40	Rec.**
Kraulis	27	18	2	140	Died
	37	14	7	100	Rec.
Horwitz, Blalock, Harris	25	5	2	50	Rec.***
	34	6	3	75	Rec.
	8	35	2	125	Rec.***

*Further insulin treatment—discharged as recovered from psychosis.

**Mental condition not given.

***Insulin treatment continued after protracted coma—no improvement in mental state.

SUMMARY AND CONCLUSIONS

1. Three cases of protracted coma are reported, one of which showed a very severe reaction of an organic nature and ended with recovery although no further insulin treatment was given.

2. In three instances where adrenalin was given as a therapeutic measure after failure to respond to glucose, there followed repeated generalized convulsions of an extrapyramidal nature that seemed to result in deeper comatose states and added to the critical state of the patients.

3. We would like to bring up for consideration the suggestion Kraulis of utilizing artificial prolonged comatose states as a therapeutic endeavor in cases where the usual insulin or metrazol treatment fails.

REFERENCES

1. Easton, N. L.: Case of protracted hypoglycemia. Amer. J. Psychiat., 94: 853, Jan., 1938.
2. Maloney, C. B., and Honan, M. S.: Complications of insulin shock therapy. J. Ment. Sc., 83: 630, Nov., 1937.
3. Salm, H.: Bennommenheitzustände in Anschluss an die Insulinshockbehandlung von Schizophrenen. Munchen. Med. Wchnschr., 84: 1046, July, 1937.
4. Kraulis, W.: Der protrahierte Shock in der Insulinbehandlung der Schizophrenie. Schweiz. Arch. f. Neurol. u. Psychiat. (Ergänzh) 39: 219, 1937.
5. Leppien, R., and Peters, G.: Todesfall infolge Insulinshockbehandlung bei einem Schizophrenen. Zeit. f. d. ges. Neurol. u. Psychiat., 160: 444, 1937.
6. Ferraro, A.: Personal communication to the authors.
7. Sherril, J. W., and MacKay, E. M.: Deleterious effects of insulin shock. Proc. Exper. Biol. and Med., 36:515, May, 1937.
8. Wolhill, F.: Ueber Hirnbefunde bei Insulin ueberdosierung. Klin. Wehnschr., 7:344, 1928.
9. Teerbruegge, A.: Anatomischer Befund bei spontaner Hypoglykämie infolge multipler Pankreasinseadenome. Beit. z. path. anat. u. z. allg. Path., 88:37, 1932.
10. Bodecthal, G.: Der Hypoglykämische Shock und seine Wirkung auf das Zentralnervensystem. Deutsches Arch. f. Klin. Med., 175:188, 1933.
11. De Morsier, G., and Mozer, J. J.: Lésions cérébralles mortelles par hypoglycémie. Ann. de med., 59: 474, 1936.
12. Stief, A., and Tokay, L.: Beitrage zur Histopathologie und Pathogenese der experimentellen Insulinvergiftung. Ztschr. f. d. ges. Neurol. u. Psychiat., 139: 434, 1932; 153: 561. 1935.
13. Schereschewsky, N. A., Mogilnitzky, N., and Gorjaawa, A. W.: Zur Pathologie und pathologischen Anatomie der Insulinvergiftung. Endokrinologie 5: 204, 1929.
14. Tanni, N.: Experimentelle Beitrage zum Insulinkrampf. Psychiat. et. neurol. jap., 39: 5, 1935; abstr., zentralbl. f. d. ges. neurol. u. Psychiat., 80:30, 1936.
15. Grayzel, D. M.: Changes in the central nervous system resulting from convulsions due to hyperinsulism. Arch. Int. Med: 54: 695, 1934.
16. Weil, A., Liebert, E., and Heilbrunn, G.: Histopathologic changes in the brain in experimental Hyperinsulism. Arch. Neurol. and Psychiat., 39: 467, March, 1938.
17. Holmes, E. C.: Oxidations in central and peripheral nervous tissue. Biochem. J., 24: 914, 1930.
18. Damashek, W. A., Myerson, A., and Stephenson, C.: Insulin hypoglycaemia. Arch. Neurol. and Psychiat., 33: 1, 1935.
19. Gildea, E. F., and Cobb, S.: The effects of anaemia on the central cortex of the cat. Arch. Neurol. and sychiat., 23: 876, 1930.
20. Courville, C. B.: Asphyxia as a consequence of nitrous oxide anesthesia. Medicine, 15: 129, 1936.

PROLONGED COMA IN THE INSULIN TREATMENT OF DEMENTIA PRAECOX

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During the past year, at the Pilgrim State Hospital, 65 cases of dementia præcox have been treated with hypoglycemic shock therapy according to the method of Dr. Manfred Sakel. Many interesting clinical and psychological reactions have been observed but the situation causing the most concern has been that of the prolonged coma. This reaction has the character of a syndrome with a definite neurological pattern. It has been observed in 11 cases.

The reaction develops as follows. The patient has received the regular treatment dose of insulin as determined for his case, but fails to respond when given sugar by nasal tube. Intravenous glucose is then employed and after the administration of 40 to 60 c.c. of 33 per cent glucose, instead of the patient arousing from coma as is usual in the uncomplicated case, a period of excitement begins.

This period of excitability is characterized by marked motor unrest, the activity consisting of violent, rapid and rhythmical flexion movements involving large muscle groups and assuming patterns suggestive of attempts at walking or swimming. During this state the pupils become widely dilated and are either fixed or sluggish. A peculiar whining cry develops. The deep reflexes are hyperactive and the Babinski sign usually is present. In the more severe cases pareses have been observed. The pulse becomes very rapid, attaining rates of 200 or above and the respiration also becomes very fast and labored. A rise in temperature accompanies the reaction, in one case 104.8° being reached. This phase lasted from two hours in the shortest case to about eighteen hours in the longest, with a decrease, of course, in the intensity of the reaction as time passed.

Following the excitement the patient becomes quiet but is still in coma and inaccessible. During this period, however, focal neu-

rological signs disappear, the temperature falls, and pulse and respirations drop to normal figures. In our cases, this period has varied from one hour to 14 days.

After the quiet phase, if the course is favorable, consciousness returns. Then evidence of cortical derangement is apparent as indicated by confusion, aphasia, disorientation and memory defect. This period of cortical impairment is most severe in the cases where the coma has been most prolonged. It has varied in time from a few minutes to as long as 36 days.

An outstanding fact is that the above reaction developed and continued despite the presence of a normal or high blood sugar level as shown by laboratory determinations.

Four illustrative case reports are given in some detail.

Case Reports

Case 14. S. F., a white female, 20 years of age, was admitted to Pilgrim State Hospital, May 14, 1937, with a history of illness of six months duration. On admission, she was mute, untidy and apathetic, but for brief periods of time became boisterous, elated and silly. Her general physical health was good and routine laboratory procedures gave negative results. Blood sugar was 85 mgm. The diagnosis of dementia præcox, hebephrenic type, was made.

Hypoglycemic shock therapy was started June 15, 1937. She received an initial dose of 15 units of insulin which was increased gradually to 100 units, on the eighth treatment day, at which time coma occurred. On July 23, 1937, the twenty-second treatment day, she received 90 units of insulin at 7:15 a. m. She went into coma at 8:20 a. m., with the usual excessive salivation, perspiration, and hypertonicity. One hour later her pupils measured 2.5 mm. and were sluggish. At 11:30 a. m. they measured 2 mm. and were fixed. The pulse was regular, there was no respiratory difficulty, and she appeared in good condition. At 12 noon, she was given 120 grams of sugar by gavage. She did not respond, however, and at 12:30 the pupils measured 7 mm. and were fixed. She was given 60 c.c. of 33 per cent glucose by vein and at 1 p. m. she was given 5 c.c. of adrenalin. The pupils remained large (7 mm.) but began

to react slightly to light. Considerable motor activity then developed, the movements being rhythmical in nature and involving large muscle groups. Flexion occurred at the hip, to such an extent that the body and extremities formed a right angle, the patient stiffly holding this position for considerable periods of time. At 1:30 p. m. she was given an additional 60 c.c. of 33 per cent glucose intravenously and at 1:40 p. m. a blood sugar was taken and reported as 196 mgm. of sugar per 100 c.c. She continued without essential change, occasionally emitting a peculiar whining cry. She exhibited the choreic hand at times. At 3 p. m. the blood sugar level had fallen to 87 mgm. and she was given 200 c.c. of 33 per cent glucose by vein. The temperature gradually rose to 102°. At 3:30 p. m. she was given a gavage of sugar and orange juice. The state of hyperactivity persisted until 10 p. m., at which time she became quiet but was still comatose and utterly inaccessible. The next morning the temperature was normal and the patient quiet, although in a peculiar lethargic state. She had been comatose for about twelve hours. The therapy was discontinued.

Mental improvement in this case was striking and began after the first coma and continued throughout the treatment. She lost all superficial manifestations of her psychosis, became rational in her speech and action, and was paroled August 1, 1937. Her adjustment to the home situation has been excellent. She obtained a minor clerical position on her own initiative, and has continued to be well adjusted.

Case 32. M. C., a white female, 24 years of age, was admitted to Pilgrim State Hospital, September 10, 1937. She had a previous admission to a State hospital in 1934, diagnosis dementia præcox, paranoid type. The present episode became manifest during the latter part of August, 1937. At first she appeared confused, elated, and talkative, but later developed a period of mutism, during which she maintained fixed postures. On admission she was overactive and talkative, and her productions were erotic and obscene. Physically, she showed nothing of an organic neurological nature. Blood sugar was 115 mgm. and urine negative. Spinal fluid Wassermann was negative, with no abnormality in gold curve or cell count and globulin was negative. The blood Wassermann

was 2 plus. A diagnosis of dementia præcox, catatonic type, was made.

Hypoglycemic shock therapy was started October 18, 1937, with an initial dose of 15 units. This was gradually increased to 90 units, on the fifth day, when coma occurred. On October 26, 1937, she went into coma at 9:48 a. m., on a dose of 90 units. Nothing abnormal was noted until 11:30 a. m., when she became very pale and ceased to perspire. She was then given 125 grams of sugar by nasal tube. She did not respond and at 12:20 p. m. was given 170 c.c. of 33 per cent glucose intravenously. Marked motor activity appeared during the administration of glucose by vein. There was a shifting Babinski and a paresis of the right facial muscles. She was then given .5 c.c. of adrenalin, which seemed to increase the excitement and increase the pulse rate. The same whining cry heard in other cases was again noted. All muscle groups were spastic. She showed a tendency to flex the trunk so as to form a right angle with the lower extremities. Rhythmical contractions of the jaw muscles caused a slight laceration of the tongue. A blood specimen taken at 1:15 p. m. was reported as 255 mgm. At 2:30 p. m. (before the report was received) she was given 190 c.c. of 50 per cent glucose and 30 c.c. of 33 per cent glucose by vein. She became somewhat less restless after this and the pulse rate which had been approximately 250 fell to 135. The temperature had risen to 103.2°. A catheterized specimen of urine taken at 3:10 p. m., was highly positive for sugar. At 3:40 p. m. the same constant motor activity was present and the paresis of the right facial muscles was more apparent. The pupils, formerly widely dilated and fixed, now showed a pronounced hippus. A blood sugar specimen taken at 3:30 p. m. was reported as 290 mgm. The movements diminished during the night, though some motor unrest was still apparent. She was incontinent and could not be made to swallow. Accordingly, she was given 80 c.c. of 50 per cent glucose intravenously and a gavage of carbohydrate foods. She perspired freely, opened her eyes when stimulated, but could not be aroused. The next morning at 8 a. m. a blood chemistry was taken and showed 140 mgm. of sugar. A lumbar puncture showed an initial 150 mm. of water. After removal of 10 c.c. of fluid the pressure

varied between 25 and 50 mm. Laboratory examination showed the spinal fluid sugar to be 105 mgm., globulin negative, 1 W. B. C., and no R. B. C.'s. The temperature varied between 100° and 101°. Another blood specimen at 1 p. m. was again reported as 140 mgm. It was necessary to tubefeed the patient the next day (October 28), but after this she began taking small quantities of orange juice and eggnog by mouth. On October 31, five days after the initial symptoms, she showed the first signs of returning consciousness by replying "Yes, I am" to any and all questions, provided the stimulus was vigorous enough. Later in the evening she was calling her own name "Marie," in an incoherent fashion. She continued to be incontinent of urine and feces. On November 1, 1937, the patient appeared in good physical condition. Temperature was normal and she ate satisfactorily. However, when questioned, she was found to be in an aphasic state. A detailed study of this condition was not made. She replied to all questions with the stereotyped phrase, "Yes, I am," and when asked to name simple objects she also used this phrase. By November 4, there was some improvement in naming difficulty and she was able to name four objects correctly before calling a handkerchief a glove. However, she was not fully able to synthesize material correctly. When shown a coin with the inscription "one cent" towards her she said, "one cent," while the same coin, with the Lincoln head towards her elicited the response "I don't know." Given a newspaper she pronounced correctly single words but read directly across the page instead of by columns and obtained no meaning from what she read. She gradually improved and by November 30, could no longer be considered aphasic. However, she displayed marked poverty of thought, was disoriented for time and place, and exhibited gross memory defect. No delusions, hallucinations, nor trends could be elicited. On November 19, 1937, the spinal fluid Wassermann was again reported as negative and the blood Wassermann again as 2 plus. By December 15, 1937, marked improvement had taken place and she was considered to have reached her prepsychotic level. Since then she has continued in good mental condition.

The presence of syphilis in this case naturally brings up a possible complicating factor. However, previously a case with syphilis was treated with hypoglycemic shock therapy and nothing was observed which would indicate that the systemic syphilis influenced or was influenced by the hypoglycemic reaction; incidently, the result in this case was excellent. In the case under consideration, careful neurological examination and serological tests revealed no evidence of syphilis of the central nervous system. Spinal fluid examination following the episode described was reported as negative and there was no change in the blood (2 plus). We do not believe that syphilis was in any way responsible for the condition reported.

Case 44. D. E., a white female, aged 27 years, was admitted to Pilgrim State Hospital, November 19, 1937, by transfer from a private hospital where she had been taken August 19, 1937, after a six-day illness. She expressed ideas of reference and persecution, admitted auditory hallucinations, and displayed a marked trend against her husband. Physical examination was negative, routine laboratory procedures reported within normal limits and blood sugar was 100 mgm. Diagnosis: dementia præcox, paranoid.

Hypoglycemic shock therapy was started with this patient on December 15, 1937. She received an initial dose of 20 units of insulin which was increased by 20 units daily until on the fourth day coma occurred with a dose of 80 units. However, this reaction was not considered sufficiently deep and the dosage was increased to 90 units on the seventh day and continued at this level for 11 days. Her reaction to the treatment for the most part was quite satisfactory. However, on January 7, 1938, the eighteenth day of her treatment, she was given 90 units of insulin at 7:40 a. m. She had a smooth, uneventful reaction but failed to respond when given 110 grams of sugar by nasal tube at 12 noon. She had been in coma for two hours and 10 minutes. At 12:35 p. m. she was given 100 c.c. of 33 per cent glucose by vein. After the first 20 c.c. of glucose she began to show hypermotility consisting of gross violent muscle movements, predominantly flexor in type and involving large muscle groups. This caused motion at the shoulders, elbows, hips, and knees. An ankle clonus was present. At 1:40 p. m. a peculiar

whining cry developed. The motor activity continued and was noted to be much like that of a person trying to swim. The pulse during this reaction was very rapid and when counted with a stethoscope at 2:40 p. m., the rate was approximately 160 per minute. Her breathing was very rapid and there was marked hyperventilation. Her temperature began to rise at 1:12 p. m. and by 3 o'clock was 102°. She could not be aroused by any stimulation and the reaction occurred in the presence of a high blood sugar, that is, 165 mgm. at 1:20 p. m. She continued in coma and was tube fed at 7 p. m. By this time she was much quieter but could not be aroused. However, she was in contact and able to speak rationally at 10 p. m. She was in a comatose state for approximately ten hours.

The next day she had no complaints and had returned to her former status. After three days rest it was decided to try her again on treatment. She was started with a dose of 20 units which was increased the next day to 30 and which resulted in a satisfactory state of coma. She was continued for 10 days but never permitted to attain any great depth of coma. She showed marked mental improvement during the treatment, her general attitude and behavior improving, and she became very pleasant, cooperative, and helpful about the ward. She admitted her previously expressed persecutory ideas and felt that they might have been imaginary but did not develop complete insight. However, at the end of the treatment no hallucinations, delusions, or trends could be elicited. Her affective reactions for the most part were adequate and appropriate. She left the hospital, February 5, 1938.

Case 50. L. L., a white male, Italian, aged 23 years, was admitted to Pilgrim State Hospital, September 20, 1937. He was said to have been ill for only two months and on admission was inactive and mute. He walked with a peculiar manneristic gait. General physical and neurological examinations were negative. Routine laboratory procedures reported within normal limits. Blood sugar 105 mgm. Diagnosis: dementia præcox, catatonic.

Hypoglycemic shock therapy was started with this patient on December 21, 1937. He received an initial dose of 20 units of insulin, which was increased gradually, until on the fourth day on a

dose of 70 units, he went into coma. However, this reaction was light and it was found necessary to increase the dose until on the seventh day he received 85 units, which gave a satisfactory reaction. This dose was continued for 11 days and then reduction was found necessary until on the thirty-sixth treatment day, he received 65 units, which was continued without further change.

On February 14, 1938, the fortieth treatment day, he was given 65 units of insulin at 7:20 a. m. He was in deep coma at 10:30 a. m. and nothing unusual was noted. At 12 noon he was given 100 grams of sugar by nasal tube. He failed to respond to this and at 12:30 p. m. was given 120 c.c. of 33 per cent glucose by vein. He still failed to arouse. He became spastic, developed rhythmic muscle movements, and his pulse rose to 170, respirations became very rapid, reaching a rate of 52. Pupils were 8 mm. and fixed. Blood sugar at 1:22 p. m. was 185 mgm. He was given 40 c.c. of 50 per cent glucose at 3 p. m. but the reaction continued. At 6:45 p. m. he still made constant movements of his extremities and still showed marked hyperventilation. A left Babinski was present. His neck was stiff and his temperature 104.6°. At 10:45 p. m. he showed Cheyne-Stokes breathing, which was relieved by coramine. At 11 p. m. he was given 20 c.c. of 50 per cent glucose. At 11:10 his breathing again became periodic and coramine was repeated. The next day, February 15, 1938, the patient was observed to have a left hemiparesis. He continued without essential change, remaining in coma, but his general condition improved and focal neurological signs disappeared. He became much quieter, although somewhat restless, however, without any definite pattern being observed in his movements. Temperature dropped to normal as did the pulse rate. He required tube feeding, which was done twice daily. By February 28, he appeared terminally ill. His respirations again became quite rapid, he showed dullness over both lungs, posteriorly, with diminished breath sounds. The temperature rose to 102°, white blood count was 38,000, a diagnosis of bronchopneumonia was made. He died March 1, 1938. Permission for an autopsy was refused. During the treatment the patient had shown some mental improvement. He became cooperative, helped

willingly with the ward work, and talked freely. However, his productions were delusional and disconnected.

Comment

The development of the prolonged coma reaction presents the physician with a difficult and urgent clinical problem. The onset of these reactions, in our experience are apparently unpredictable, there being no changes or differences in procedure to account for them. All of the cases had previously experienced smooth hypoglycemic reactions on similar dosage.

The outstanding feature, from the therapeutic standpoint, is that the reaction continues in the presence of a normal or high blood sugar. When called upon to deal with such a condition for the first time, the tendency is invariably to push the administration of intravenous glucose. Nothing is to be gained by such a procedure as the excess is simply spilled over as soon as the renal threshold is passed. Adrenalin is contraindicated as it accelerates the rate of an already overworked heart and any liver glycogen mobilized will be unnecessary because the blood sugar is already normal or above.

We now carry out the following procedure in cases receiving insulin therapy. The patient is given sugar solution by nasal tube and unless definite signs of return to consciousness are observed, in one-half hour 33 per cent glucose is given by vein. Regardless of the reaction of the patient we limit the intravenous injection to 120 c.c. (40 grams) as we have found that this amount will raise the blood sugar level well above the renal threshold for glucose. Should a prolonged coma reaction develop, the patient is watched carefully but nothing further is done until two hours have elapsed. Then 40 c.c. of 50 per cent glucose is administered by vein, the increased concentration being used because of its dehydrating effect. The handling of the case from this point consists simply in combating the symptoms as they arise and the maintenance of adequate nourishment. In the one case showing respiratory collapse, coramine proved to be an effective stimulant. Good nursing care during this period is of paramount importance.

The physiology and pathology in the reaction under consideration is not entirely clear. The hypoglycemic state has been the subject of many experimental attempts to evaluate the physiology involved. Olmsted and Logan[1] suggested that this state might really be akin to an anoxemia in that the lowering of the blood sugar might cause oxidative processes to become depressed to such a degree that the brain cells, known to be susceptible to a lack of oxygen, were affected in much the same way as in asphyxia. W. Dameshek and A. Myerson[2] made simultaneous determinations of the oxygen content of arterial and venous blood in the hypoglycemic state and found that there was a marked diminution in the arteriovenous difference in content of oxygen during this state. They felt that this might be significant of an actual diminution of the oxygen uptake by the brain.

The great susceptibility of nervous system cells to derangement of oxygen supply is outwardly expressed, first, in a state of heightened irritability and second in suppression of activity; but complete recovery may be expected if the normal state of oxidation is restored before too great a degree of cellular damage has occurred.

The central nervous system shows a difference in the nutritive requirements of its various parts. McLeod[3], states that in general, reversibility is not to be expected in the case of complete anemia in small pyramidal cells after 8 minutes, Purkinje cells after 13 minutes, medullary centers after 30 minutes, spinal cord 60 minutes, sympathetic ganglia 3½ hours, and myenteric plexus 8 hours. This illustrates the relatively greater susceptibility to disturbances of oxidation in the structures of more highly specialized function.

The disturbances of function within the central nervous system are in many cases so intricate that their correlation with alterations of structure are very difficult. However, we may expect that, depending on the degree and duration of the anoxemia, cellular changes of a varying degree of intensity will take place. These in a broad way, at least in the case of induced hypoglycemia, conform to the outline of McLeod[3], that is, higher levels are affected first. We may have a period of excitement followed by loss of consciousness. Then signs of striatal involvement appear with patho-

logical reflexes. Later, a more profound state of suppression of activity is seen, with loss of tendon and skin reflexes and finally the suppression of vital medullary centers.

S. B. Wortis[4] and others have demonstrated that the respiratory quotient of brain tissue is unity, indicating that carbohydrate is of prime importance in the metabolism of the brain. This does not mean necessarily that a reaction takes place directly between molecular oxygen and carbohydrate, but for practical purposes the reaction may be considered as such. In asphyxia from ordinary causes an anoxic anoxemia develops due to limitation of oxygen supply. In the case of hypoglycemia, however, an anemic anoxemia develops, using the term anemic in a broad sense to cover other than cellular elements of the blood or hemoglobin. In addition, there may be an element of stagnant anoxemia due to impaired circulation.

In our fatal case we unfortunately had no autopsy. However, fatal cases have been reported, with definite organic findings. Bowen and Beck[5], in a necropsy, reporting on a fatal case of hypoglycemia (a diabetic) found marked edema of the brain and cord with hyperemia and small hemorrhages.

DeMosier and Mozer[6] reported a case of morphinomania treated with insulin where death was due to hypoglycemia, and in which the brain was edematous and swollen with a pale cortex and injected membranes. Small subarachnoid hemorrhages, perivascular infiltrations in the cortex and central gray nuclei, cell pallor and lack of Nissl substance and satellitosis and neuronophagia of the Betz cells were described. Baker and Lufkin[7] report three fatal cases in which they describe essentially the same findings of hemorrhage and swelling, except that the hemorrhages were scattered irregularly through the brain. Moersch and Kernohan[8] describe two cases in which there was edema, extravasation of red cells into perivascular spaces and widespread degeneration of the nerve cells in the cerebral cortex and basal ganglia with acute changes in the microglia and oligodendroglia. Cobb[9] refers to Keyes, Fried, and Riggs, as reporting the same basic pathology in five patients who died of hypoglycemia.

While the pathological changes reported are not specific, cellular damage undoubtedly does occur. We believe that in every hypoglycemic reaction such changes occur to a degree, but in the usual case are easily reversible by the administration of sugar. The factor determining reversibility or irreversibility is not clear.

The possibility of such changes taking place to a degree still compatible with life but leaving permanent residual defect is, of course, to be considered.

Conclusion

We believe that in cases of prolonged insulin coma the clinical signs observed are explained on the basis of actual cellular pathology. We consider the process to be an encephalopathy caused by interference with normal oxidative processes.

REFERENCES

1. Olmstead, J. M. D., and Logan, H. D.: The effect of insulin on the central nervous system and its relation to the pituitary body. Am. J. Physiol., 66:437, 1923.
2. Dameshek, W., Myerson, A., and Stephenson, C.: Insulin hypoglycemia; mechanism of neurologic symptoms. Arch. Neurol. and Psychiat., 33:1-18, Jan., 1935.
3. McLeod, J. J. R.: Physiology and Biochemistry in Modern Medicine. C. V. Mosby Co., 1926, pp. 167-170.
4. Wortis, S. B.: Nelson's Loose Leaf Medicine, Vol. 6, Chap. 2, 1934.
5. Bowen, B. D., and Beck, G. M.: Insulin hypoglycemia: Two cases with convulsions: One necropsy report. Ann. Int. Med., 6:1412, May, 1933.
6. DeMosier, G., and Mozer, J. J.: Fatal cerebral lesions due to hypoglycemia in course of therapy of morphinomania. Ann. de Med., 39:474-487, May, 1936.
7. Baker, A. B., and Lufkin, N. H.: Cerebral lesions in hypoglycemia. Arch. Path., 23, 190, Feb., 1937.
8. Moersch, F. P., and Kernohan, J. W.: Hypoglycemia, neurologic and neuropathologic study. Arch. Neurol. and Psychiat., 39:242-257, Feb., 1938.
9. Cobb, Stanley: Shock therapy. New England J. Med., Vol. 217, No. 5, 195-196, 1937.

FURTHER METABOLIC STUDIES REGARDING THE EFFECT OF INSULIN HYPOGLYCEMIC THERAPY IN MENTAL PATIENTS*

Metabolic Changes Accompanying the Glucose Tolerance Test Before and After the Course of Treatment

BY MEYER M. HARRIS, M. D., JOSEPH R. BLALOCK, M. D., AND WILLIAM A. HORWITZ, M. D.

Recent developments in endocrinology have shown that there is a complex interplay between the glands of internal secretion and other tissues. Thus, for example, the administration of estrin will depress that function of the anterior pituitary gland which stimulates the ovary to produce the sex hormone. On the other hand, removal of the ovaries with loss of the sex hormones, results in an increased activity on the part of the anterior pituitary to produce follicle stimulating hormone. Similarly it might be expected that the prolonged administration of large doses of insulin and the repeated hypoglycemic shocks would produce important changes in the metabolic organization of the body.

In 1926 Fornet and Christensen[1] reported that following insulin administration in both man and rabbits glycosuria developed when the insulin was discontinued. In 1932, Wilder and his coworkers[2] noted a decrease in glucose tolerance in two obese patients in whom they were studying the effect of insulin on the rate of loss of weight. Boller and Uberrack[3], in their study of the effect of chronic and acute hyperinsulinism, also found that it produced a decrease in carbohydrate tolerance and concluded that counter regulatory mechanisms come into ascendency to produce this effect. Clark, Gibson and Paul[4] also reported the occurrence of a decreased glucose tolerance after prolonged insulin administration to nondiabetic patients. Blotner[5] reported on the change in glucose tolerance of 25 thin nondiabetic patients who were receiving insulin therapy. He found that six cases remained normal, six cases had normal blood sugar curves but transient glycosuria one to two hours after meals during insulin administration and four cases showed considerable increase in blood sugar and glycosuria following a glucose test meal, their curves simulating that of mild

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diabetes. Nine cases tested four months to two years after insulin was stopped gave normal curves. He pointed out, as had previous investigators, that the decreased tolerance where it occurred was a transient phenomenon. Odin[6] found that a diet poor in carbohydrate, and continued insulin administration, was more effective in decreasing carbohydrate tolerance than one rich in carbohydrate with insulin. He believed that the explanation for the altered carbohydrate tolerance, offered by previous workers, of a decreased insulin production as an adaptation on the part of the pancreas to the administration of insulin, was inadequate. Looney and Cameron[7], and Maher and Somogyi[8] have recently reported the production of a decreased carbohydrate tolerance in schizophrenic patients receiving insulin hypoglycemic treatment. A careful review of the literature reveals that from the metabolic standpoint, the effect of prolonged insulin administration on carbohydrate metabolism has been the chief point of metabolic investigation.

In our previous study[9] we reported upon the acute metabolic effects of the insulin hypoglycemic state on various phases of metabolism both organic and inorganic. In this study we have investigated the possible effect of prolonged insulin hypoglycemic treatment upon carbohydrate metabolism and the concomitant metabolic changes of other metabolites. It has been pointed out by various investigators that glucose administration produces changes in the metabolism of other organic and inorganic constituents. Furthermore, it has been claimed that in conditions in which carbohydrate metabolism is affected these concomitant changes may be altered thus reflecting the severity and the nature of the metabolic disturbance. In view of the alteration in carbohydrate tolerance reported to follow prolonged insulin administration it was considered desirable to investigate the metabolism of other metabolites besides glucose during the carbohydrate tolerance test.

Procedure

The initial tests were carried out during the control period prior to insulin therapy. During this period, the patient was treated on the insulin wards receiving placebos of hypodermic injections of

saline instead of insulin and about 25 to 50 gm. of glucose in water daily to simulate the insulin treatment period. They also received the same diets as the patients receiving insulin, which insured a liberal carbohydrate intake. Twenty c.c. of blood was drawn from the anterior cubital vein without stasis, this being repeated one-half, one, two and three hours thereafter. Compression of the vein was applied only for a few moments to facilitate venipuncture prior to glucose administration. A portion of the blood was oxalated and examined for total reducing substance, fermentable reducing substance or true blood sugar, and amino-acid nitrogen. Another portion was collected under oil and kept in the ice box for one-half hour. The serum was then removed and analyzed for potassium, inorganic phosphorus and refractive index (for methods see references 10, 11, 12, 13, 14).

From 60 to 73 gm. of glucose dissolved in 300 c.c. of water, flavored with lemon juice, was administered orally to the patient in the postabsorptive state. This dose was approximately equivalent to 1 gm. of glucose per kg. of body weight. The same amount of glucose was used before and after the course of insulin shock treatment in each case irrespective of the change in weight of the patient resulting from the treatment. The postinsulin tolerance test was carried out at 24 to 48 hours after insulin injection with the exception of case No. 6, on whom the test was carried out 96 hours after the last insulin injection. The insulin treatments ranged from 21 to 47 in number and the coma-producing dose of insulin varied from 55 to 220 units. The technique for treating the cases was essentially that described by Sakel.

Glucose Tolerance

The glucose curves before insulin administration were all essentially normal. None showed any abnormally high peaks. One patient, No. 6, showed a delayed recovery phase over a three-hour period. This patient displayed some mild agitation during this test which may have been a factor in producing this curve. Patient No. 9, whose behavior was hypomanic, had a blood sugar curve which reached the highest peak of the entire group and also did not return to its original level in three hours.

After the course of insulin treatment some of the cases showed a very marked decrease in carbohydrate tolerance as can be seen from Graphs I, II and III (patients Nos. 4, 2, 7, 8, 1 and 5). In one case, No. 3, although the blood sugar curve rose to a somewhat higher peak in the postinsulin period still the recovery phase was complete after two hours whereas in the first test the recovery phase required three hours. It would be difficult to interpret this as any appreciable alteration in tolerance. Patient No. 9, who was hypomanic in her behavior prior to treatment, showed an improvement in tolerance (See Graph V).

The initial fasting blood sugar levels after insulin treatment were either the same as or somewhat higher than those before treatment.

Inorganic Serum Phosphorus

The finding that phosphorus played an important role in intermediary carbohydrate metabolism led to a series of studies regarding their correlation. Salversen[15] found that glucose administration to parathyroidectomized dogs produced a very marked drop in the inorganic phosphorus of the blood with temporary alleviation of the manifestations of tetany.

Harrop and Benedict[16] reported that glucose administration produced a drop in the inorganic phosphorus of the blood. The lowest depression of phosphorus occurred after the peak of the blood sugar curve. They explained this effect as due to stimulation of the mechanism for handling glucose by the elevated blood sugar. Perlzweig and his coworkers[17] confirmed this finding. Blatherwick and his coworkers[18], however, reported that the drop in inorganic phosphorus following glucose administration was not a constant finding. In some of their cases they obtained no change and in others a rise. They offered no explanation for these variations.

In a series of investigations regarding blood sugar and the inorganic phosphorus changes, Barrenschein et al.[19] reported different types of phosphorus curves in relation to the types of blood sugar curves. They pointed out that such correlated studies gave one a better insight into some of the metabolic processes involved in carbohydrate metabolism.

Hartman and Foster[20] in a study of 500 clinical cases regarding sugar tolerance and blood phosphate curves found the latter a valuable supplement to the glucose tolerance curve for the detection of abnormal carbohydrate metabolism.

McCullagh and Alstine[21] in a study of 230 patients also reported that the changes of the blood phosphates after glucose administration in patients suffering from metabolic disorders frequently differ from the normal although these changes were not pathognomonic. They gave 100 gm. of glucose orally and found an average drop of 0.7 mg. of inorganic phosphorus per 100 c.c. of whole blood. It was seldom less than 0.2 mg. nor greater than 1.2 mg. per 100 c.c. They found in normals the greatest depression occurred at the end of two hours after glucose administration and following the peak of the blood sugar curve. It returned to the initial level in three to four hours. This is similar to the findings of some of the previous investigators.

This brief review of a very extensive literature regarding the relation of carbohydrate and phosphorus metabolism indicates the value of such a correlated study regarding the reported alteration in carbohydrate metabolism in patients receiving insulin hypoglycemic therapy.

Results

In the tolerance tests before treatment all of the patients except one showed a drop in phosphorus following glucose administration. In this exceptional case, No. 2, (Graph I) the phosphorus remained practically unchanged for one hour and then rose above the initial level. The blood sugar curve, however, showed no abnormality.

Following insulin treatment a number of cases showed marked alterations in the inorganic phosphate curves. Case No. 1 (Graph III) who before treatment showed a prompt and appreciable drop in phosphorus now showed practically no change for two hours and an appreciable rise three hours after glucose. In case No. 6 (Graph IV) there was also a marked rise in phosphorus, while case No. 2 (Graph I) who showed no evidence of phosphorylation before insulin treatment now showed not only an absence of phosphorylation but a marked rise in phosphorus between the second and third

hours after glucose. Patient No. 9 who showed a very marked drop in inorganic phosphate before treatment, had relatively slight changes in this constituent after treatment.

It would appear from these data that carbohydrate metabolism following glucose administration may proceed in some patients with evidence of varying degrees of phosphorylation as manifested in the fall in inorganic phosphorus of the blood. In other cases the metabolism of the ingested carbohydrate appears to proceed, so far as one can determine from the blood sugar curves, without any evidence of such phosphorylation and in fact with an increased liberation of inorganic phosphorus. This may point to some important differences in metabolic processes involved in the carbohydrate metabolism in different patients. The level of inorganic phosphorus in the blood may represent the balance between processes of phosphorylation and those processes tending to liberate inorganic phosphorus. This balance appears to be definitely altered after insulin shock therapy. It has been shown, for example, by Cori and Cori[22] that in adrenalectomized rats the injection of glucose and insulin produces only a slight temporary drop in the inorganic phosphorus in the blood, whereas in the intact animal the drop is more pronounced and prolonged. This they have reported to be due to the formation of hexosemonophosphate in the skeletal muscles only of the intact animals, as a result of the adrenalin which is secreted during the hypoglycemic state produced by the insulin. Here then a disturbance in the shift in inorganic phosphorus portrays a marked disturbance in neurohumoral regulatory mechanisms. The marked drop in inorganic phosphorus in parathyroidectomized dogs following glucose administration with temporary relief of symptoms of tetany has been previously mentioned. This is an example of the important role which these shifts in phosphorus may play secondarily in the physiology of the organism.

Serum Potassium

It has been known for some time that some relationship exists between carbohydrate and potassium metabolism.[23, 24] In animal and man changes in blood potassium are known to follow carbohydrate ingestion and insulin administration.[16, 25, 26] In a previous

paper[9] the important role which this element plays in the carbohydrate metabolism of the brain and cellular physiology in general, and also its relation to various neurohumoral mechanisms in the body was discussed. The function of the adrenal cortex and medulla in the metabolism of potassium and carbohydrates is another indication of the probability of some important relationship.[27-36]

Observations

The potassium of the serum shows a tendency to fall after glucose administration with variable fluctuations toward recovery. This fall may be maintained three hours after glucose administration. These changes do not parallel the phosphorus changes and the potassium level may remain depressed even after the blood sugar has returned to its original level or below it.

After a course of insulin treatment there is a tendency for the potassium to be either somewhat lower initially, in the postabsorptive state, or more readily lowered after glucose administration.

Case No. 6 (Graph IV) whose potassium level was higher than that of any of the other patients was the only one who showed a small rise one-half hour after glucose, followed by a very marked drop which was maintained at the three-hour period. Following a course of insulin treatment the level of potassium in this case was considerably reduced and the concomitant changes following glucose administration were minimal compared to the other cases. It may be of interest to note that this case before treatment had a blood sugar curve showing delayed recovery as previously described.

The changes in potassium following glucose administration were not so marked as those usually seen under the influence of large doses of insulin as previously reported[9]. Although some changes in the level of potassium occur in control patients as reported in our previous paper, the changes following glucose are somewhat more pronounced than control cases having similar initial levels of potassium.

The fact that following insulin administration, the potassium changes are so very much more marked than after the administra-

tion of large amounts of glucose would tend to indicate that some secondary factors aside from that due to increased carbohydrate metabolism, are brought into play during the action of insulin. Adrenalin secretion due to the hypoglycemia may be one of these factors.[22, 35]

The changes in potassium observed after a course of insulin treatment may indicate an alteration in neurohumoral regulatory mechanisms which mechanisms have been shown recently to affect the level of blood potassium.[33, 34, 35, 45, 46]

Amino-acids

Folin and Berglund[37] noted a reduction in the nonprotein nitrogen in the blood after the administration of 200 gm. of glucose. They considered this to be due to the sparing action of carbohydrates on protein metabolism.

Green, Sandiford and Ross[38] also found a reduction in the amino-acids of the blood following 100 gm. of glucose. The reduction bore no relation, however, to either the respiratory quotient or the increased metabolism of glucose. They did not think the explanation was so simple as that given by Folin. Martens[39] pointed out that the factors that regulate the blood sugar must constitute an equally important element in maintaining the level of the blood amino-acids since the level of the latter remains constant in a 48-hour postabsorptive period, but is upset by glucose administration.

He also found that in the depancreatized dog there is a rise in amino-acid nitrogen in the first half hour after glucose administration. In mild diabetes in the human, however, the curve was normal, but in severe diabetes a rise in amino-acids was obtained. This was somewhat similar to the findings of Slavich and Torrine[40]. A rise or the absence of a fall in blood amino-acids following glucose administration is believed by some investigators[39] to be due to an insufficiency of insulin or to some mechanism interfering with the action of insulin.

That insulin depresses the amino-acid in the blood was shown in our previous publication[9]. It was hoped, therefore, that a study of the amino-acid changes following glucose administration might

aid in evaluating the nature of the alteration in carbohydrate metabolism resulting from prolonged insulin hypoglycemic treatment, and also yield some information regarding the effect of the treatment on protein metabolism *per se*.

Observations

It is apparent that glucose administration resulted in a decrease in the level of the blood amino-acids both before and after insulin treatment. In one case, No. 5 (Graph III), following insulin treatment, there was a slight rise in the level of amino-acids during the first half-hour after glucose administration which was then followed by a fall.

It appears from the behavior of the level of blood amino-acids that in spite of the alteration in the factors regulating carbohydrate metabolism the relation between carbohydrate and protein metabolism has not been equally affected. It is possible that if insulin secretion has been depressed as a result of the treatment, the depression has not been sufficiently marked to notably affect the interrelation between the two groups of metabolites. Other possible causes of the disturbance in carbohydrate tolerance, aside from changes in insulin secretion, might be located primarily in the liver[42] or in the anterior pituitary gland.[43, 44, 45] The latter, perhaps, is stimulated by the repeated hypoglycemic states to secrete an increased amount of the so-called glucogenic principle as a counteracting measure.[44, 45] Considering the regulatory role of the anterior pituitary, this would appear highly plausible. Also changes in the adrenal glands both in the medulla and cortex have been reported by some investigators to occur in animals as a result of prolonged insulin hypoglycemic treatment.[45, 46] It is a question to what extent, if any, they are primarily responsible for the decreased carbohydrate tolerance which has been observed. Because of the important relationship of both the adrenal cortex and medulla to carbohydrate metabolism this possibility must be borne in mind. A tendency to a depression of the potassium in the blood previously described would be in keeping with increased adrenocortical activity. It is planned to investigate further this possibility. The effect which these various suggested changes might have on amino-acid metabolism is not clear at the present time.

It should be noted that there is a tendency for the initial postabsorptive amino-acid level to be lowered after insulin treatment. Only one case, No. 9 (Graph V), of dementia præcox with hypomanic features, showing an improved carbohydrate tolerance after treatment, had a very marked rise in the initial postabsorptive level of amino-acids in the blood. While several possibilities suggest themselves to account for this phenomenon it would be futile to speculate regarding them at the present.

Summary and Conclusions

1. The changes in various phases of metabolism resulting from the prolonged insulin treatment of psychotic patients is being investigated.

2. Seventeen cases have thus far been studied before insulin treatment but as yet only nine of these have been studied in the postinsulin period.

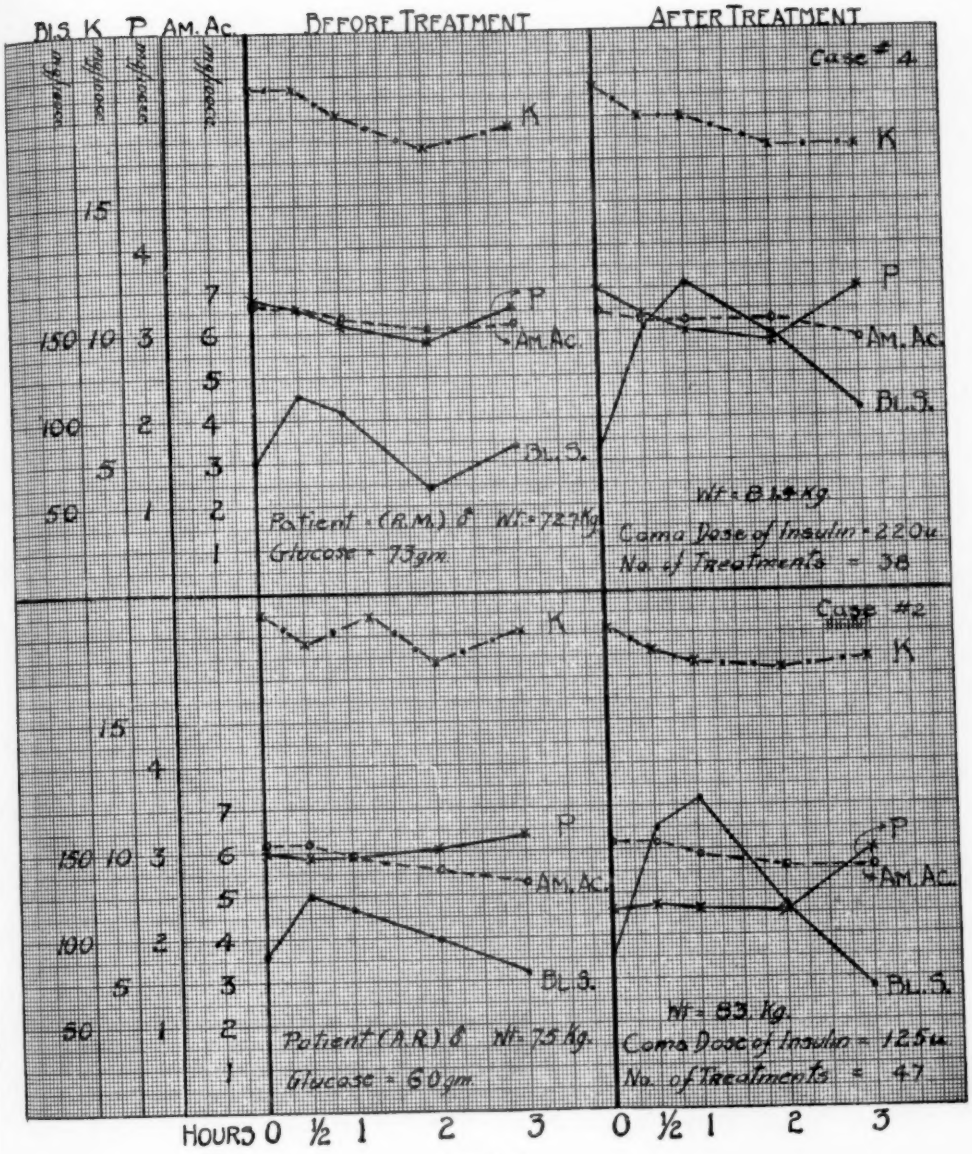
3. A decrease in carbohydrate tolerance was observed in six of these nine cases thus far completed. One case showed an increase in tolerance following insulin treatment.

4. Alterations in the curves of serum potassium and inorganic phosphorus following a glucose test meal were observed and the possible significance of these changes discussed.

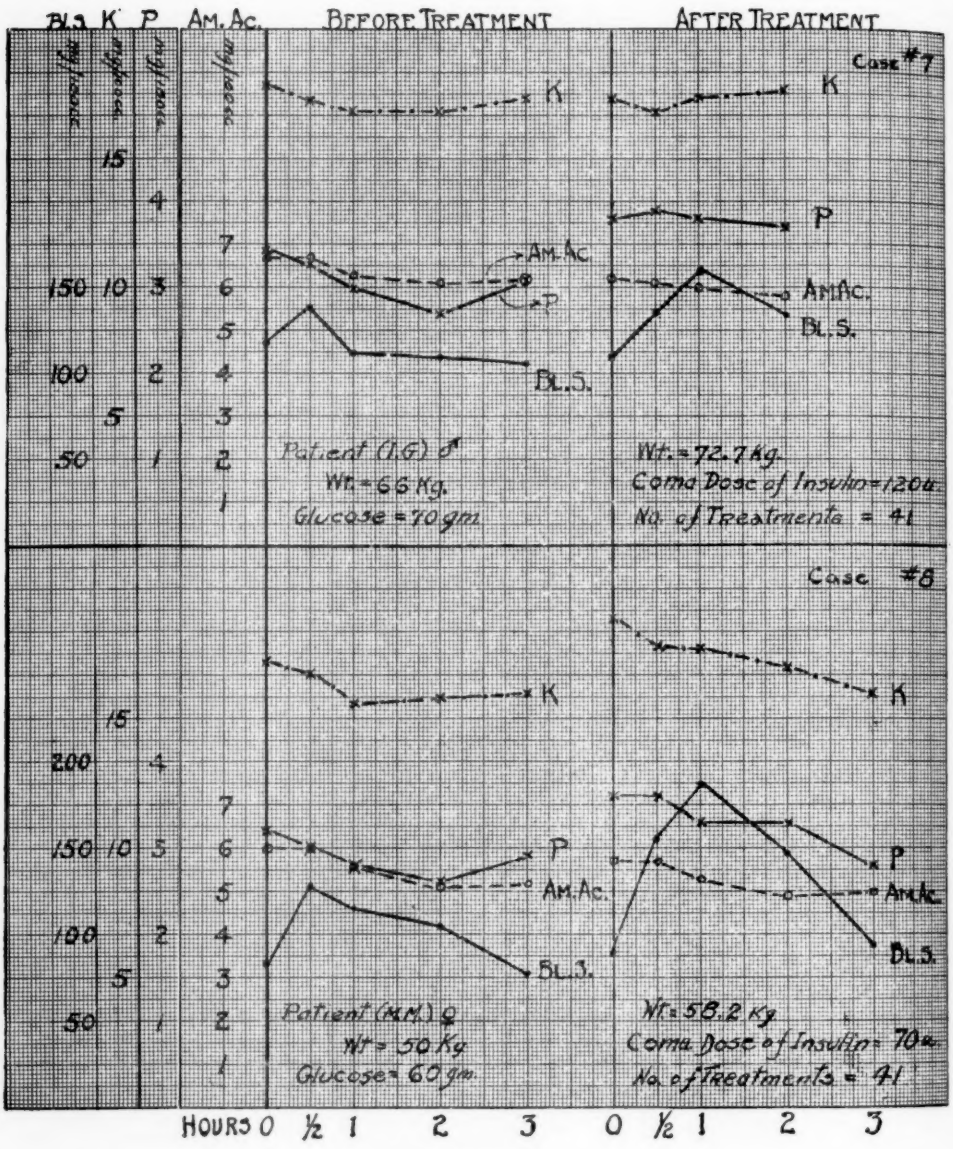
5. The administration of glucose produced a fall in the level of blood amino-acids both before and after insulin treatment. In one case there was a slight rise in amino-acid level during the first half-hour after glucose followed by a drop during subsequent periods.

6. The possible significance of the metabolic alterations due to prolonged insulin administration is considered.

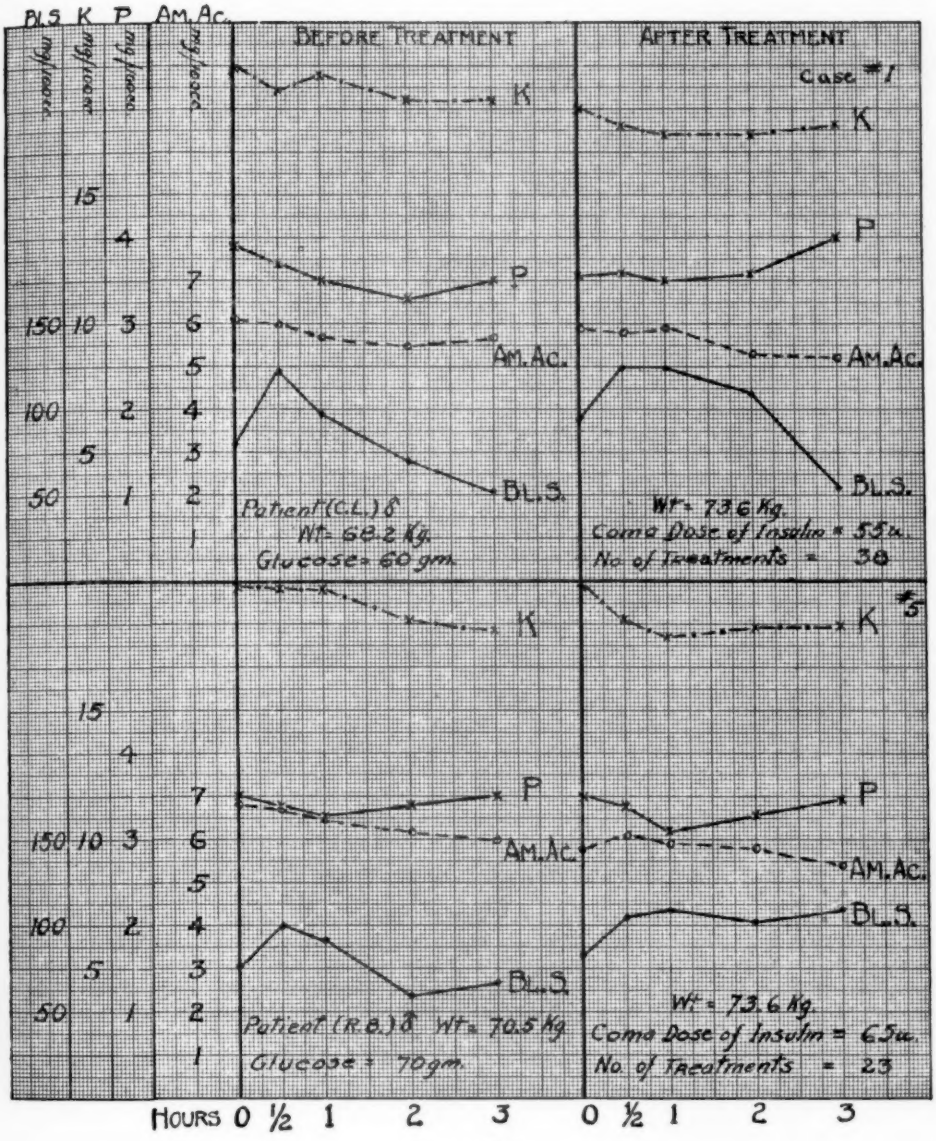
7. This study indicates that important alterations may be produced in many phases of the metabolism of the organism as a result of prolonged insulin shock treatment. This probably indicates an alteration in regulatory mechanisms and in the general course and interplay of metabolic processes.


Bl.S. K P Am.Ac.
BEFORE TREATMENT
AFTER TREATMENT
Case # 4
K
P
Am.Ac.
Bl.S.
Patient (R.M.) ♂ Wt. 72.7 Kg.
Glucose = 73 gm.
Wt = 81.8 Kg.
Coma Dose of Insulin = 220 u.
No. of Treatments = 38
Case #2
Patient (A.R.) ♂ Wt. 75 Kg.
Glucose = 60 gm.
Wt = 83 Kg.
Coma Dose of Insulin = 125 u.
No. of Treatments = 47
HOURS 0 ½ 1 2 3 0 ½ 1 2 3

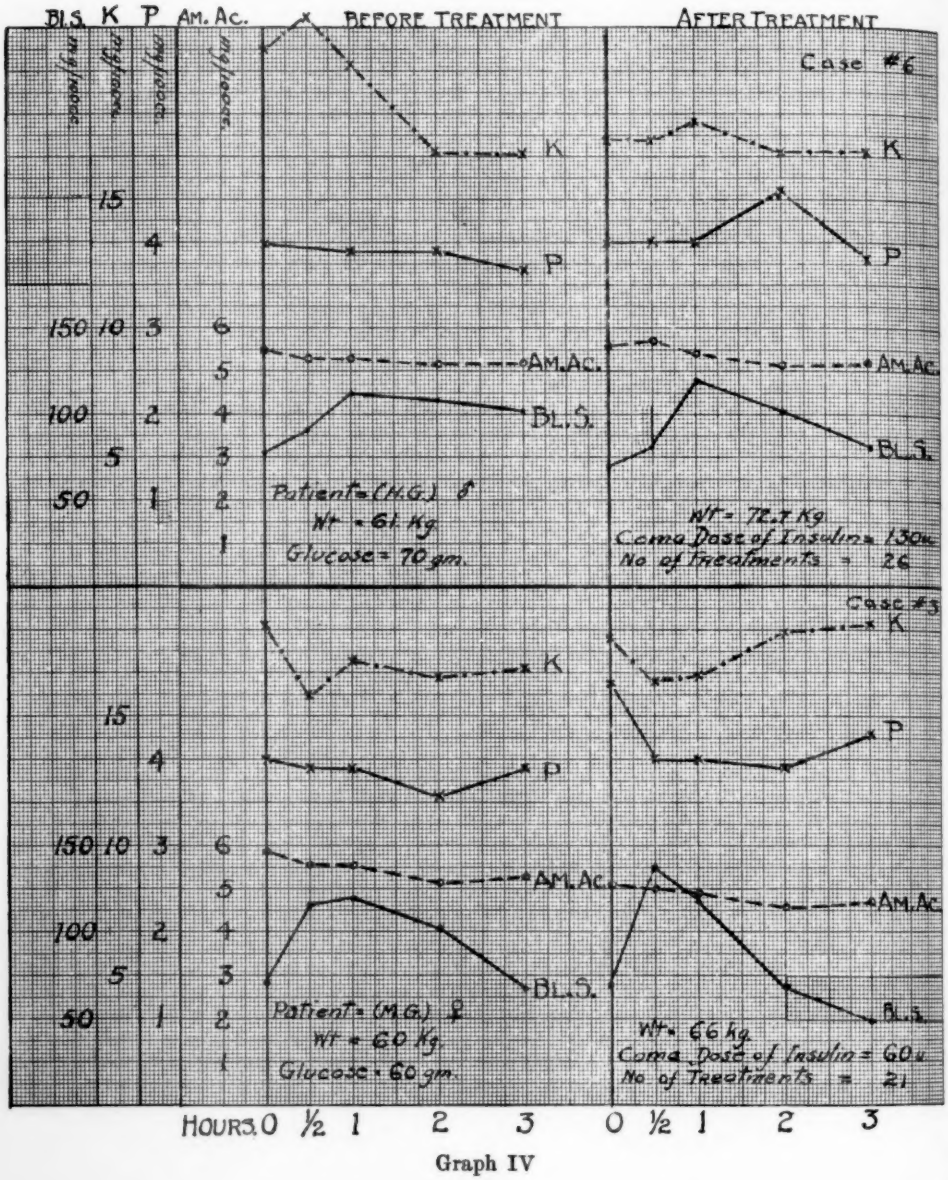
Graph I


Bl.S. K P Am.Ac.
mg/100cc
mg/100cc
mg/100cc
mM/liter
BEFORE TREATMENT
AFTER TREATMENT
Case #7
K
P
Am.Ac.
Bl.S.
Patient (I.G.) ♂
Wt. = 66 Kg.
Glucose = 70 gm.
Wt. = 72.7 Kg.
Coma Dose of Insulin = 120 u.
No. of Treatments = 41
Case #8
K
P
Am.Ac.
Bl.S.
Patient (M.M.) ♀
Wt. = 50 Kg.
Glucose = 60 gm.
Wt. = 58.2 Kg.
Coma Dose of Insulin = 70 u.
No. of Treatments = 41
HOURS 0 ½ 1 2 3 0 ½ 1 2 3

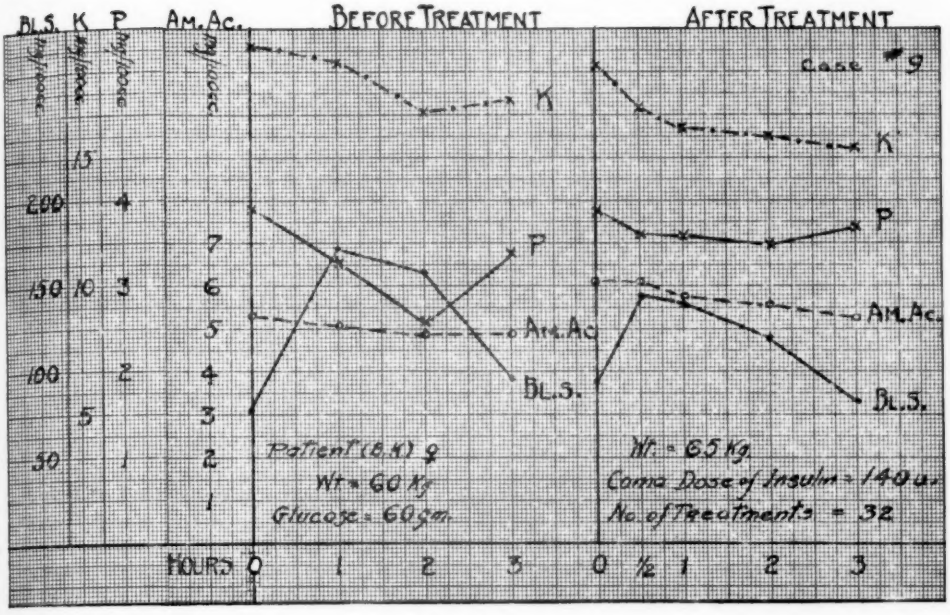
Graph II


BL.S. K P Am.Ac.
mg/100cc
mg/100cc
mg/100cc
mg/100cc
BEFORE TREATMENT
AFTER TREATMENT
Case #1
K
P
Am.Ac.
BL.S.
Patient (C.L.) ♂
Wt. 68.2 Kg.
Glucose = 60 gm.
Wt. = 73.6 Kg.
Coma Dose of Insulin = 55 u.
No. of Treatments = 30
#5
Patient (R.B.) ♂ Wt. = 70.5 Kg.
Glucose = 70 gm.
Wt. = 73.6 Kg.
Coma Dose of Insulin = 65 u.
No. of Treatments = 23
HOURS 0 ½ 1 2 3 0 ½ 1 2 3

Graph III


BL.S. K P Am. Ac.
BEFORE TREATMENT
AFTER TREATMENT
Case #6
K
P
Am. Ac.
Bl. S.
Patient = (H.G.) ♂
Wt = 61 Kg.
Glucose = 70 gm.
Wt = 72.7 Kg.
Coma Dose of Insulin = 130u.
No. of Treatments = 26
Case #5
Patient = (M.G.) ♀
Wt = 60 Kg.
Glucose = 60 gm.
Wt = 66 Kg.
Coma Dose of Insulin = 60u.
No. of Treatments = 21
HOURS 0 ½ 1 2 3 0 ½ 1 2 3

Graph IV



Graph V

REFERENCES

1. Fornet, W., and Christensen, E.: Das pardoxe Insulinphenomenon. Schweiz. Med. Wchnschr., 7:228 and 726, 1926.
2. Wilder, R. M., Smith, F. H., and Sandiford, I.: Observations on Obesity. Proc. of Staff Meetings of Mayo Clinics, 7:290, 1932.
3. Boller, R., and Uberrack, K.: Der Einfluss chronischer und akuter Hyperinsulinisierung auf die alimentären Hyperglykämie. Wien. Arch. Inn. Med., 23:173, 1932.
4. Clark, B. B., Gibson, R. B., and Paul, W. D.: A study of the role of insulin in metabolism in nondiabetic patients. J. Lab. and Clin. Med., 20:1008, 1934-35.
5. Blotner, H.: Insulin and sugar tolerance in thin people. Arch. Int. Med., 53:153, 1934.
6. Odin, M.: Decreased carbohydrate tolerance after insulin treatment of nondiabetic persons. Acta. Med. Scand. Suppl., 78:713, 1936.
7. Looney, J. M., and Cameron, D. E.: The effect of prolonged insulin therapy on glucose tolerance in schizophrenic patients. Proc. Soc. Exper. Biol. and Med., 37:253, 1937.
8. Maher, J. T., and Somogyi, M.: Effect of insulin on carbohydrate tolerance of nondiabetic individuals. Proc. Soc. Exper. Biol. and Med., 37:615, 1938.
9. Harris, M. M., Blalock, J. R., and Horwitz, W. A.: Metabolic studies during insulin hypoglycemic therapy in the psychoses (to appear in Arch. of Neurol. and Psychiat).
10. Folin, O., and Wu, H.: A simplified and improved method for determination of sugar. J. Biol. Chem., 41:367, 1920.
11. Peters, J. P., and Van Slyke, D. P.: Determination of fermentable sugar in blood by measuring the decrease in reducing substance caused by yeast fermentation. Quant. Clin. Chem., Vol. II, 478, William & Wilkins Co., 1932.
12. Simonelli, U.: Microdetermination of amino-acid in blood by Folin method. Reforma. Med., 12:445, 1934.

13. Breh, F., and Gaebler, O. H.: The determination of potassium in blood serum. J. Biol. Chem., 87:81, 1930.

14. Fiske, C. H., and Subbaraw, Y.: The colorimetric determination of phosphorus. J. Biol. Chem., 66:375, 1925.

15. Salversen, H. A.: The function of the parathyroids. J. Biol. Chem., 56:443, 1923.

16. Harrop, G. A., and Benedict, E. M.: The participation of inorganic substances in carbohydrate metabolism. J. Biol. Chem., 59:683, 1924.

17. Perlzweig, W. A., Latham, E., and Keefer, C. S.: The behavior of inorganic phosphates in the blood and urine of normal and diabetic subjects during carbohydrate metabolism. Proc. Soc. Exper. Biol. and Med., 21:33, 1923-24.

18. Blatherwick, N. R., Bell, M., and Hill, E.: Some effects of insulin on carbohydrate and phosphorus metabolism of normal individuals. J. Biol. Chem., 61:241, 1924.

19. (a) Barrenscheen, H. K., and Eisler, A.: Beitrage zum Problem des Blutzucker. Die Kurve der alimentären hyperglycemia). Biochem. Ztschr., 177:27, 1926.
(b) Barrenscheen, H. K., Daleschall, F., and Popper, L.: Blutzucker and Phosphorsaurekurve. Ibid., 177:39 and 50, 1926.

20. Hartman, F. W., and Foster, D. P.: Clinical evaluation of blood phosphate and sugar tolerance. Am. J. Clin. Path., 2:289, 1932.

21. McCullagh, D. R., and Van Alstine, L. V.: Phosphates in sugar tolerance tests. Am. J. Clin. Path., 2:277, 1932.

22. (a) Cori, C. F., and Cori, G. T.: Influence of epinephrine and insulin injections on hexosephosphate content of muscle. J. Biol. Chem., 94:581, 1931.
(b) Cori, C. F.: Mammalian carbohydrate metabolism. Physiol. Rev., 11:143, 1931.

23. (a) Thompson, W. H., and McQuarrie, I.: Effects of various salts on carbohydrate metabolism and blood pressure in diabetic children. Proc. Soc. Exper. Biol. and Med., 31:907, 1934.
(b) McQuarrie, I., Thompson, W. H., and Anderson, J. A.: Effect of excessive ingestion of sodium and potassium salts on carbohydrate metabolism and blood pressure in children. J. Nutrition, 11:77, 1936.

24. Silvette, H., and Britton, S. W.: Influence of potassium on blood sugar and tissue glycogen. Proc. Soc. Exper. Biol. and Med., 37:252, 1937.

25. Briggs, A. P., Koechig, I., Doisy, E. A., and Weber, C J.: Some changes in the composition of blood due to the injection of insulin. J. Biol. Chem., 58:721, 1923-24.

26. Kerr, S. E.: The effect of insulin and of pancreatectomy on the distribution of phosphorus and potassium in the blood. J. Biol. Chem., 78:35, 1928.

27. (a) Britton, S. W., and Silvette, H.: Effects of corticoadrenal extracts on carbohydrate metabolism. Am. J. Physiol., 100:701, 1932.
(b) The apparent prepotent function of the adrenal glands in normal animals. Ibid., 100:693, 1932.

28. Kendall, E. C.: A chemical and physiological investigation of the suprarenal cortex. Cold Spring Harbor Symposia on Quantitative Biol., Vol. 5:299, 1937.

29. Evans, G. T.: The adrenal cortex and endogenous carbohydrate formation. Am. J. Physiol., 114:297, 1936.

30. Buell, M. V., Anderson, I. A., and Strauss, M. B.: On carbohydrate metabolism in adrenalectomized animals Am. J. Physiol., 116:274, 1936.

31. Zwemer. R. L.: Electrolyte and sugar determinations as indicators of adrenal influence. Cold Spring Harbor Symposia on Quantitative Biol. Vol. 5:323, 1937.

32. (a) Long, C. N. H.: The influence of the pituitary and adrenal glands on carbohydrate metabolism. Medicine, 16:215, 1937.
(b) Katzin, B., and Long, C. N. H.: The effect of adrenocortical hormone on the liver and muscle glycogen of normal fasting mice and rats. Proc. Am. Physiol. Soc. 50th Annual Meeting, 113, 1938.

33. D'Silva, J. L.: The action of adrenalin on serum potassium. J. Physiol., 86:219, 1936.

34. (a) Marenzi, A. D., and Gershman, R.: Adrenalin et potassium sanguin Compt. Rend. Soc. de Biol., 124:382, 1937.

(b) Houssay, B. A., Marenzi, A. D., and Gershman, R.: Potassium sanguin et mechanisme sympathique adrenalinohepatique. Ibid., 124:383, 1937.

(c) Variation du potassium et mechanisme sympathico-adrenalinohepatique suivant les conditions physicopathologiques et pharmacologiques. Ibid., 124:384, 1937.

35. Keys, A.: The response of plasma potassium level in man to the administration of epinephrine. Am. J. Physiol., 121:325, 1938.

36. Britton, S. W., and Silvette, H.: The adrenal cortex and carbohydrate metabolism. Cold Spring Harbor Symposia on Quantitative Biol., Vol. 5:357, 1937.

37. Folin, O., and Berglund, H.: The retention and distribution of amino-acids with special reference to urea formation. J. Biol. Chem., 51:395, 1922.

38. Green, C. H.. Sandiford, K., and Ross, H.: The amino-acid content of the blood in normal and pathologic conditions. J. Biol. Chem., 58:845, 1923-24.

39 Martens, R.: l'aminoacidemie et les facteurs de sa régulation. Arch. Internat. de Med. exper., 8:362, 1933.

40. Slavich, R., and Torrine, A.: Alteration in amino-acid level caused by administration of glucose to normal persons and diabetics. Boll. Soc. Ital. Biol. Sperm., 11:669, 1936. (From Nutrition Abstr. and Rev., 7:110, 1937.)

41. (a) Luck, L. M., and Morse, S. W.: The effect of insulin and epinephrine on the amino-acid content of the blood. Biochem. J., 27:1648, 1933.

(b) Davis, B. L., and Luck, J. M.: The effect of acetylcholine and other constituents of the suprarenal gland upon blood sugar and amino acid. Am. J. Physiol., 117:542, 1936.

42. (a) Soskin, S., Allweiss, M. D., and Cohen, D. J.: Influence of the pancreas and the liver upon the dextrose tolerance curve. Am. J. Physiol., 109: 155, 1934.

(b) Soskin, S, and Allweiss, M. D.: The hypoglycemic phase of the dextrose tolerance curve. Am. J. Physiol., 110:4, 1934.

(c) Soskin, S., and Mirsky, A.: The influence of progressive toxemic liver damage upon dextrose tolerance curve. Am. J. Physiol., 112:649, 1935.

43. Marks, H. P.: Discussion of physiological factors influencing the action of insulin (pituitary factor). Proc. Roy. Soc. Med., 29:663, 1935-36.

44. Houssay, B. A., Biassotti, A., and Rietti, C. T.: Action diabetogène de l'extrait anté-hypophysaire. Compt. Rend. Soc. de Biol., 111:479, 1932.

45. Riddle, O.: On carbohydrate metabolism in pigeons. (Pituitary and carbohydrate metabolism.) Cold Spring Harbor Symposia on Quantitative Biol., Vol. 5:362, 1937.

46. Poll, H.: Veränderungen der Nebennieren nach Einspritzung von Insulin. Med. Klinik, 21: 1717, 1925.

STUDIES IN PAROTID SECRETION OF PATIENTS BEFORE, DURING AND AFTER INSULIN HYPOGLYCEMIC THERAPY*

BY E. I. STRONGIN, M. D., L. E. HINSIE, M. D., AND M. M. HARRIS, M. D.

Parotid gland secretions of humans as measured by a modification of the Lashley suction disc have in recent years been studied extensively by A. L. Winsor[1, 2, 3] and his coworkers. He confirmed Lashley's[4] findings of a continuous parotid gland flow in the absence of marked exterostimulation. It was also observed that the rate of this secretion, while fairly constant within the same individual, varied from individual to individual.

It was found, during the course of experimentation on average "normal" subjects, that there was a definite range of secretory rate beyond which these subjects did not vary. Winsor and Strongin established what they call the normal secretory range of the parotid secretion under certain standard conditions.

For the past two years research[5, 6] has been under way at the New York State Psychiatric Institute and Hospital to investigate various aspects of parotid gland secretion in psychopathic patients and to compare these findings with normal findings.

As a result of this investigation it was found that parotid gland secretions of certain groups of patients differed markedly from those of the normal. It was shown that the secretory rate of the deteriorated schizophrenic patients is higher than that found in any of the controls, while the secretory rate of depressed patients with manic-depressive psychosis was lower than that found in the normal controls. This investigation is still in progress.

This report deals with parotid gland secretions in patients before, during, and in some cases, after insulin hypoglycemic treatment. The secretory rate and the potassium, chloride and protein concentrations of parotid secretion under various conditions are discussed.

*This project is being carried out with the aid of a grant from the John and Mary R. Markle Foundation. Technical determinations were carried out with the help of Miss Rosalind Roth.

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I. Experimental Procedures

A. *Methods*

1. Secretory collection. Since the details of this method have been described in previous publications,[1] it is sufficient to state that a small disc similar to the one developed by Lashley is fastened by suction over the mouth of Stenson's duct. From the inner chamber of the disc a small airtight drainage tube passes through the corner of the mouth, carrying the secretion, under its own pressure, to a pipette capable of measuring it in hundredths of a c.c. At the time of the test the subject was lying in bed.

Samples were collected at the following times:

(a) During the control period

1. Before breakfast
2. Immediately after breakfast
3. Two hours after breakfast
4. Immediately after lunch.

(b) During the insulin period

The disc was attached at about 7 a. m. and readings were taken for a half hour, after which the subject received insulin. Readings were then taken every minute until the subject went into coma. Samples for analysis were collected about every half hour at first and then with greater frequency as the rates increased. The specimens were then analyzed chemically.

2. Methods of analysis.

(a) Preparation of sample. The whole saliva sample was measured and diluted with distilled water 1:10. Samples of 0.05 to 0.5 c.c. were diluted to 5.5 c.c.. One c.c. of the diluted mixture was used for a single chloride, potassium or protein determination.

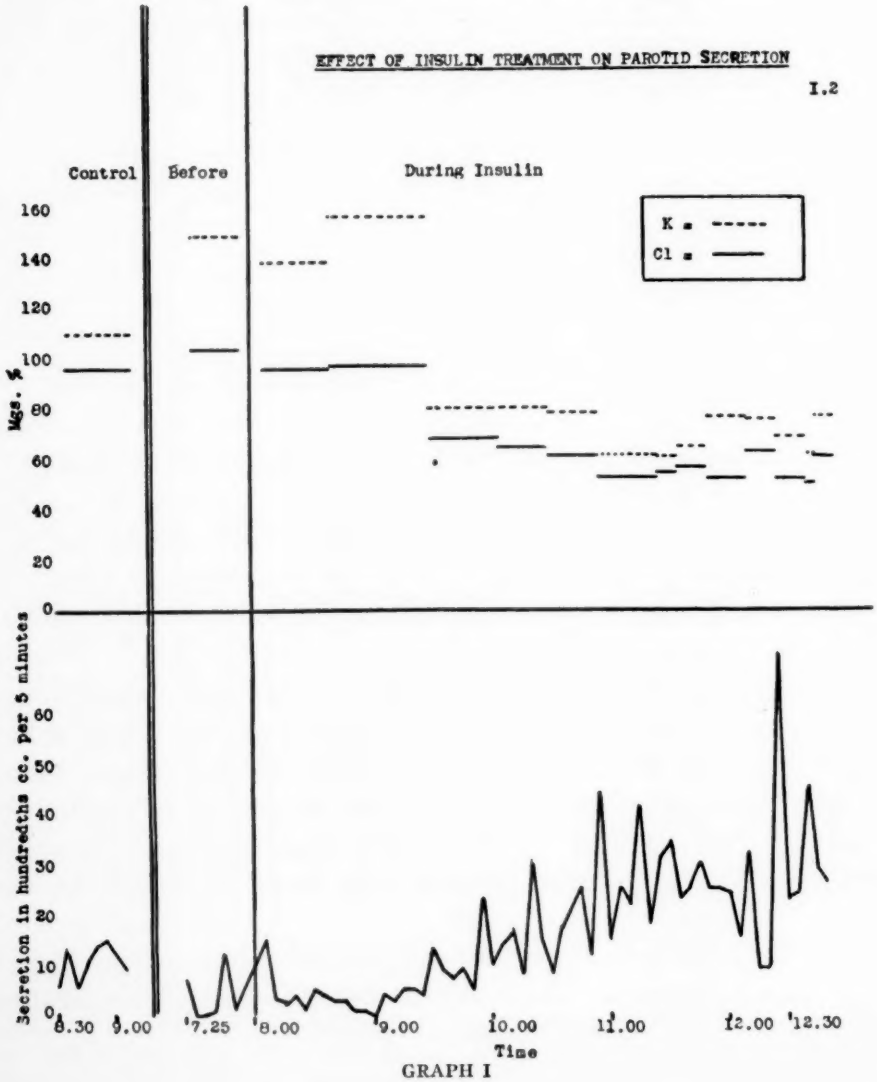
(b) Chloride determination.[7] The Claudius ultra-microapplication of the open Carius method, with minor modifications, was used.

(c) Potassium determination.[8] A modification of the Truszkowsky and Zwemer method which adapted it to the determination of potassium in saliva was used.

(d) Protein determination.[9] Protein was determined according to the modified Denis and Ayer method for cerebrospinal fluid by precipitation of the protein with sulfosalicylic acid and comparing the turbidity with a standard protein solution.

3. Selection of cases.

Ten consecutive cooperative patients diagnosed as dementia præcox were chosen upon admission to the insulin wards.



GRAPH I

B. *Results*

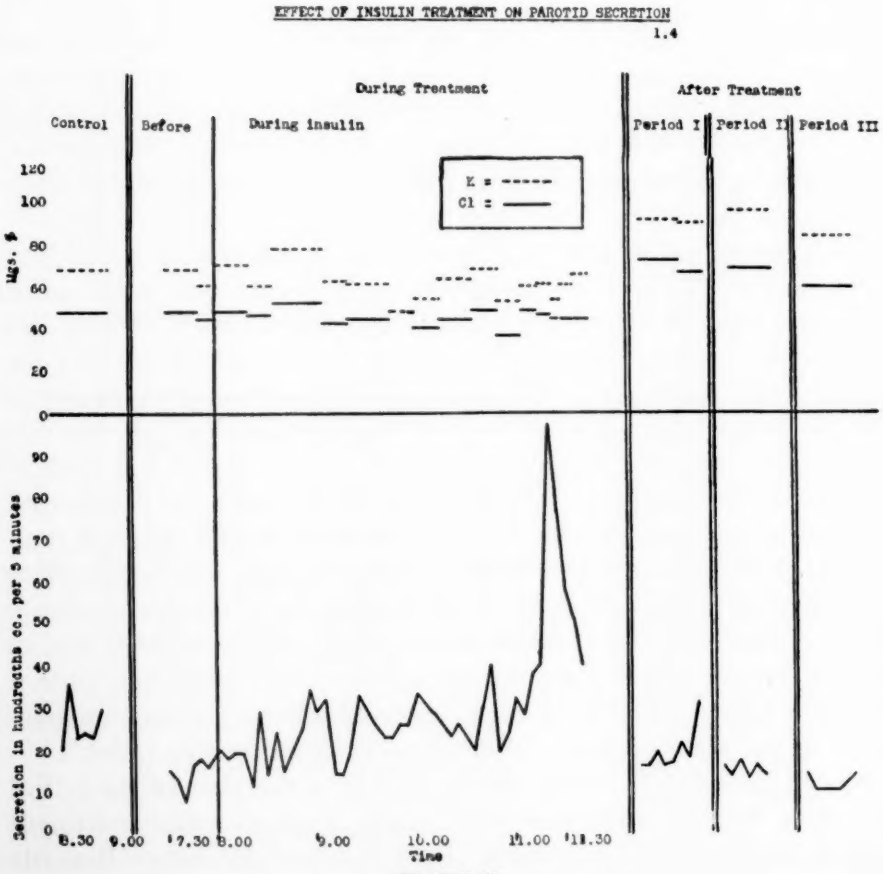
A typical experiment is illustrated in Graph I. The average secretory rate per five minutes during the control period (i. e., the period preceding hypoglycemic treatment) was .11 c.c. After a period of insulin treatment, in this case seven weeks, the secretory level during the period immediately preceding the administration of insulin (indicated by the term "before" on the graph) dropped to .04 c.c. It was characteristic of our series, save in one instance, that during the course of insulin therapy the secretory rate dropped in the interval between hypoglycemic bouts. Another way of expressing this is to state that the normal secretory rate for the individual, after he has experienced several hypoglycemic treatments, shows a pronounced diminution.

After each insulin injection the level of parotid secretion remains fairly constant during the two hours following the injection. Following the two-hour period a sharp rise in secretory rate occurs. This rise continues to increase intermittently until the patient becomes comatose at which time the secretory rate reaches its highest point. Secretory readings, after the administration of glucose, could not be obtained because the patients were too active.

A study of the level of potassium and chloride concentration in parotid secretion shows that as the secretory rate increases the level tends to drop to a certain point beyond which further increases in rate have very little effect. The percentage drop in potassium is greater than that of the chloride and consequently the difference between the level of potassium and chloride diminishes. As the initial secretory rate becomes higher both the levels and the difference between the levels of potassium and chloride concentration become less and further increases in rate occurring during the insulin hypoglycemic state produce less effect upon these levels. The effect of marked increases in secretory rate due to stimulation by lemon juice introduced into the mouth has quite a different effect upon the level of concentration of these constituents but the phenomenon will not be considered at this point.

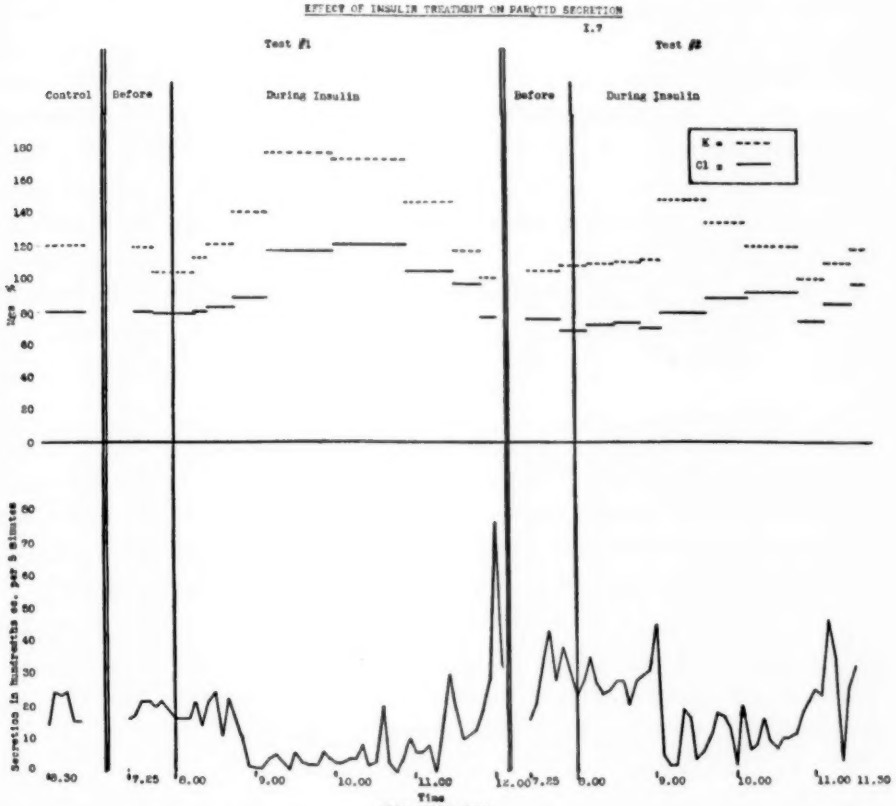
Graph II shows the same effect, namely, a decrease in the initial secretory level after a period of insulin hypoglycemic treatment and an increase in rate during the hypoglycemic state. Records

were also taken in this case at various intervals after the completion of the full course of treatment. Period I, which is five days after the end of the course of treatments, showed that the secretory rate was lower than it was originally. The secretory rate continued to drop in periods II and III, 7 and 19 days, respectively, following treatment. The initial secretory rate tended to drop during the period of treatment and continued to do so after treatment had been discontinued. This phenomenon has been studied thus far in the three cases of this series which have completed treatment. This change should not be confused with the effect of insulin stupor and coma which results in a marked increase in the rate.



GRAPH II

It was noticed, too, that as the secretory rate increased during hypoglycemia, secretion became increasingly cloudy. This was different from any previous finding since cloudy secretion usually occurs with very low secretory levels. In cases where the secretory level is higher due either to the type of individual used or to stimulation of various types (exclusive of insulin stimulation) secretion is clear. The few analyses that have been done indicate that cloudiness is closely associated with a substantial increase in the protein concentration of the saliva.



GRAPH III

The secretory rate as represented in Graph III shows atypical features. Two experiments performed on the same subject are represented in Graph III, one taken four weeks and the second taken nine weeks after the beginning of insulin treatment. The secre-

tory level during the control period (i. e., before the beginning of insulin treatment) averaged .18 c.c. per five-minute period. Contrary to our usual findings the secretory rate four weeks after the initiation of insulin therapy failed to show a diminuation but remained at approximately the control level, namely, .18 c.c. per five-minute period. Nine weeks after the initiation of insulin treatment a sharp rise in secretory rate was observed. This rise was exhibited in the interval between individual insulin treatments and is not to be confused with the rise observed while the patient is in a state of hypoglycemia. We are not prepared to do any more than merely state the fact that this patient's clinical condition became progressively worse under the administration of insulin treatment, that is, we do not know that there is any correlation between the various levels of parotid secretion and changes in the clinical state of the patient. In a previous communication[5] we expressed the opinion that among schizophrenic subjects a rise in secretory rate accompanied mental deterioration. The remaining patients who exhibited the typical curve previously described showed an improvement or a stationary course in their clinical condition.

Summary

1. The general secretory level, after a series of insulin hypoglycemic treatments, dropped considerably below the secretory level during the trial period, with the exception of the one case previously described. In the latter case a rise of secretory rate associated with regression in psychiatric condition was found.

2. The secretory level during the hypoglycemic state showed a sharp rise with the onset of stupor and coma. However, sleep, which often occurs soon after insulin administration, has the opposite effect, namely, a drop in secretory level.

3. As the secretory rate increased, a drop in the potassium and chloride concentrations occurred, this drop tending to reach a plateau beyond which further increases in rate resulting from the hypoglycemic state produce little effect.

4. The increase in rate occurring during insulin hypoglycemia was accompanied by a pronounced increase in cloudiness of the se-

cretion together with a rise in its protein content. These were first manifested at the onset of stupor and became more pronounced during coma.

REFERENCES

1. Winsor, A. L.: Factors indirectly affecting parotid secretion. J. Exper. Psychol., 13:423, 1930.
2. Winsor, A. L.: The effect of mental effort on parotid secretion. Am. J. Psychol., 43:434, 1931.
3. Strongin, E. I., and Winsor, A. L.: The antagonistic action of coffee and alcohol. J. Abnormal and Soc. Psychol., 50:301, 1936.
4. Lashley, E. S.: Reflex secretion of the human parotid gland. J. Exper. Psychol., 1:461, 1916.
5. Strongin, E. I., and Hinsie, L. E.: Parotid secretory rate in schizophrenic patients. J. Nerv. and Ment. Dis., 87:715, 1938.
6. Strongin, E. I., and Hinsie, L. E.: Parotid gland secretions in manic-depressive patients. Am. J. Psychiat., 94:1459-1466, 1938.
7. Peters, J. B., and Van Slyke, D. D.: Quantitative Clinical Chemistry II. (1932) p. 840. Williams & Wilkins Company, Baltimore, Md.
8. Truszkowsky, R., and Zwemer, R. L.: Determination of blood potassium. Biochem. Journal, 31:229, 1937.
9. Ayer, J. B., Dailey, M. E., and Smith, F. F.: Denis-Ayer method for the quantitative estimation of protein in the cerebrospinal fluid. Arch. Neurol. and Psychiat., 26:1038, 1931.

THE MECHANSIM UNDERLYING THE LOW RECTAL TEMPERATURE IN HYPOGLYCEMIA*

The Role of Adrenalin

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The hypoglycemic treatment of dementia præcox has introduced a number of heretofore unknown pharmacophysiological phenomena which require explanation. Although insulin had been studied quite thoroughly on human beings prior to its use in psychiatry it had never been administered in doses large enough to produce the profound state known as deep hypoglycemic coma. One of the symptoms present to a greater or less degree in every patient following insulin administration is the lowering of rectal temperature which begins within one-half hour following the injection, is gradual in decline, and occasionally reaches the low level of 92° F. (33.3° C.) although generally not lower than 95° F. (35° C.). Soon after the interruption of the hypoglycemic state the rectal temperature begins to rise but generally does not approach its normal level for two or three hours. This hypothermia is apparently independent of the degree of hypoglycemia as some patients displaying only a mild stupor may show a more marked temperature reaction than cases in deep coma.

What is the mechanism behind this lowering of rectal temperature? The usual explanation offered is that there is a low blood sugar, therefore less heat is formed in the body. It has been definitely shown by Dünner[1], however, that the amount of blood sugar and the low rectal temperatures are independent of each other; that frequently low rectal temperatures are recorded with normal or near normal sugars.

It is also stated that insulin disturbs the heat regulating mechanism of the body resulting in lower temperatures. Let us consider briefly the heat regulating mechanism of the body. The temperature of the body normally remains quite constant by the equalization of heat production and heat loss. Heat production is chiefly the result of oxidation processes of ingested food or, in its absence,

*Read at the annual interhospital conference held at the New York Psychiatric Institute, April 8, 1938.

of the body tissues. Heat production can be fairly accurately measured by studying the oxygen consumption as well as the carbon dioxide output. Heat loss[2] occurrs chiefly through radiation, (70 per cent), conduction and air currents, (5 per cent), evaporation through the lungs, (10 per cent), evaporation through the skin, (15 per cent). These proportions may be considerably changed according to circumstances. Thus, if the atmospheric temperature is high, heat cannot be lost readily through radiation and conduction, the evaporation of the sweat may become the chief method for heat regulation.

There apparently can be only two mechanisms capable of producing a lowered body temperature. There may be either a diminished heat production in the form of a lowered metabolism or an increased heat loss through excessive radiation, conduction and/or evaporation. Even under these circumstances it would be rather unusual for a definite lowering of body temperature to occur, for, as is well known, when the stability of the body temperature is threatened the heat regulating mechanism comes into play to offset the disturbing element and thus maintain a fairly constant temperature. For example, should the metabolism of the body be diminished for any reason there is a concomitant reflex constriction of the skin blood vessels thereby decreasing heat loss. Furthermore, there is a lessened activity of the sweat glands thus diminishing heat loss through evaporation. On the other hand, should there be an excessive formation of heat in the body as in exercise there results a compensatory increase in heat loss.

Let us consider the first question confronting us—viz.: Is there a diminished heat production following the administration of insulin? In other words, is the metabolism of the body lowered? Reiter[3] reports some fairly thorough studies on the effect of insulin on the metabolism of human beings. His results show that there is no marked change in either direction, some patients showing no change whatever, others a slight increase, and still others a slight decrease. He attempts to correlate the metabolic reaction to insulin administration with the morphologic constitution of the individual, maintaining that vagotonics and sympathicotonics react differently to similar doses of insulin. Boothy and Wilder[4]

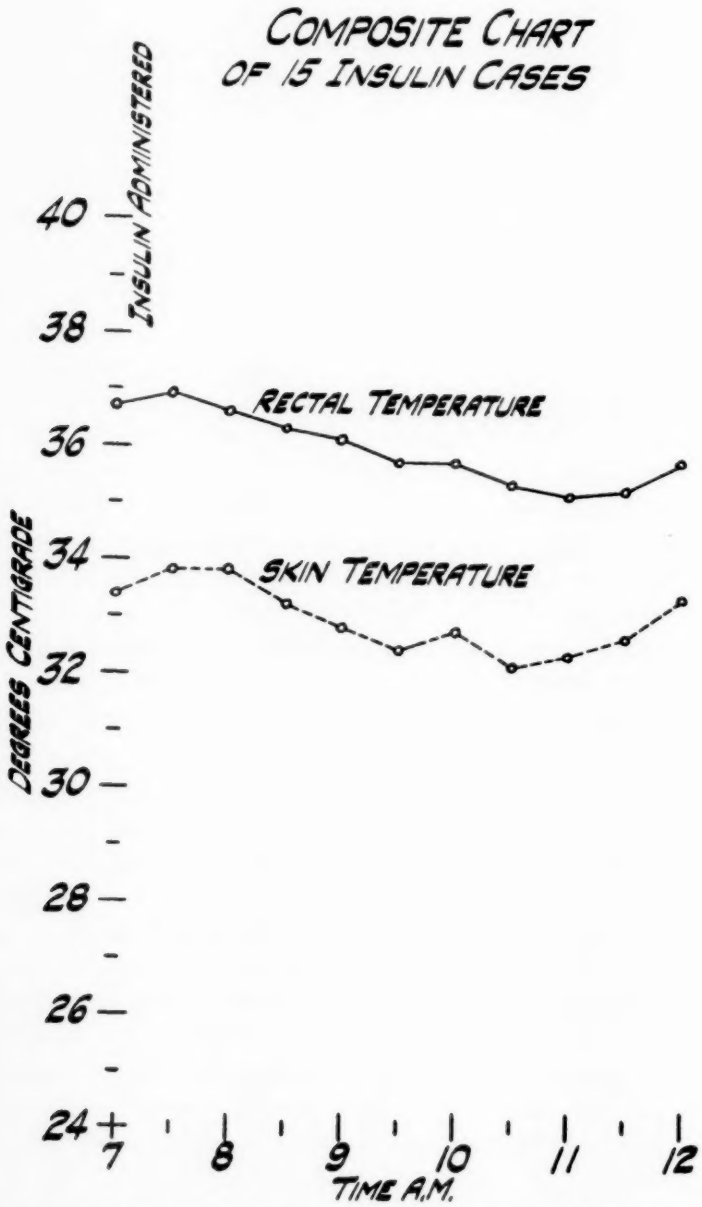

Chart I—Composite chart of the average rectal and skin temperature of 15 insulin cases showing that as the rectal temperature is lowered there is a corresponding lowering of the skin temperature.

after repeated experiments on one normal and three diabetic patients found no decrease in metabolism following an injection of insulin but more constantly found an increase as the blood sugar became progressively lower. This increase they attribute not to the insulin itself but to the compensatory increase in blood adrenalin. Wright[5] has shown in the intact as well as in the decapitated and eviscerated animal (in which the intestines have been removed and the liver blood vessels ligatured) that when insulin is administered there results an increase in oxygen consumption and carbon dioxide output. This increased metabolism may be quite appreciable.

We may, therefore, conclude that there is no evidence of diminished calorigenic activity following insulin administration.

To study the heat lost during the hypoglycemic state, 15 patients were observed. Since the skin represents the chief depot for heat dissipation, a record of skin temperatures at regular intervals would tend to indicate the comparative loss of heat through radiation, conduction and convection. The skin temperature was taken every half-hour beginning with a normal reading prior to the insulin administration. The temperatures were uniformly taken on the middle of the forehead using a special mercury skin thermometer. Simultaneous rectal temperatures were also taken. Chart I indicates that the rectal temperature beings to drop shortly after insulin administration and continues to descend steadily until termination of the treatment. As the rectal temperature drops there is an almost parallel lowering of skin temperature showing that there has been no impairment in the vasoconstricting capacity of the skin arterioles. Rather than an increased loss of heat through radiation and condition we would expect a diminished loss. Furthermore, each patient is thoroughly wrapped, except for the exposed head, in five blankets during the entire course of the treatment, which further reduces heat loss to a minimum.

The loss of heat through evaporation is an interesting one in the case of hypoglycemia. Most patients under treatment perspire quite freely. Table 1 shows the weight loss by 12 patients during an average of about four hours of treatment. This includes besides sweat, also the loss of respiratory vapor, which normally would amount to about three ounces in the four-hour period. The

TABLE 1. Showing the weight loss in fluids of twelve patients during four-hour hypoglycemic treatment period. The average weight loss is about two pounds. The average weight of the patients is about 130 pounds.

Patient No.	Insulin units	Weight before hypoglycemia	Weight after hypoglycemia	Fluid loss in lbs.	Duration of hypoglycemia
1	85	133⅜	131⅛	2¼	4:15
2	60	121¾	119¼	2½	4:15
3	85	145	142¾	2¼	3:50
4	110	148¼	145½	2¾	4:20
5	50	105	103½	1½	4:10
6	100	150½	147¾	2¾	3:50
7	100	124	121⅛	2⅞	4:00
8	75	128½	126½	2	4:15
9	70	141½	139¾	1¾	4:30
10	15	104½	103	1½	4:00
11	110	124	123	1	3:30
12	70	138	137	1	3:30

evaporation of one cubic centimeter of water extracts six-tenths calories of heat from the body which is enough heat to raise six-tenths kilograms of water one degree centigrade. To express the same value in English units we may say that the evaporation of one ounce of sweat extracts enough heat to raise the temperature of 70 pounds of water one degree Fahrenheit. Suppose we consider the average loss of sweat during the hypoglycemia to amount to 2 pounds or 32 ounces. Considering the usual normal loss of sweat through insensible perspiration as about 1½ ounces per hour or 6 ounces for the four-hour treatment period, and the loss of respiratory vapor as about 3 ounces for the same period, the actual increase in perspiration over the normal would be only 23 ounces. But evaporation can occur only from exposed surfaces. If we consider the exposed head as constituting about one-sixth of the total body surface the actual increased loss of perspiration which may conceivably effect body temperature would be only 4 ounces which at 70 English units per ounce would represent a heat loss of about 280 units, an amount of heat sufficient to raise the temperature of 280 pounds of water one degree Fahrenheit, and sufficient to lower the temperature of a patient weighing 130 pounds about two degrees Fahrenheit. However, we must remember that during this four-hour period the internal metabolism of the body is continu-

ing at fairly normal pace producing approximately 100 calories per hour (considering the amount used as 2,400 calories per day), or the equivalent of 396 English heat units. This, combined with the diminished loss of heat through radiation and conduction as a result of dermal vasoconstriction as well as the thorough wrapping of patients in blankets would tend to nullify any loss which would result from excessive perspiration.

We must, therefore, look elsewhere for a satisfactory explanation for the low rectal temperatures. We have always tacitly accepted the fact that a thermometer inserted into the rectum would in a short time register approximately the temperature of the blood circulating through that area. This assumption is generally correct but we must not forget that actually there can be only one criterion of body temperature and that is the temperature of the blood and even that varies in different portions of the body. The author has experimented with four different improvised instruments for easily measuring blood temperature but in each case the mechanical defect resulted in too great a loss of heat to be of any practical value. However, indirect observation reveals some very enlightening facts. Skin temperature studies have shown the tremendous effects that vasoconstriction can produce on skin temperatures. Is it possible that a vasoconstriction in the rectum may similarly result in low thermometer readings, and if so, what would be the cause of this vasoconstriction?

This brings us to a brief consideration of the role of adrenalin in hypoglycemia. It has been long known that the endocrines are intimately interrelated, that there are functional antagonists and protagonists so that the disturbance in one gland of internal secretion may indirectly affect other glands in the form of either an increased or decreased activity. On theoretical grounds it would be expected that a large dose of insulin, which experimentally produces a lowering of blood sugar, would result in a compensatory increase of blood adrenalin which has an antagonistic hyperglycemic effect. Furthermore, still on theoretical grounds, we would expect during normal functional activity a rather steady liberation of adrenalin into the blood stream from the suprarenals, the the amount varying according to the requirements. Stewart and

Rogoff, however, doubted such relationship. They worked with insulin on etherized dogs and cats[6], later on adrenalectomized rabbits[7] and reached the conclusion that the action of insulin on animals from which adrenals have been removed differs little from that in normal animals, showing that adrenaline plays no role in the action of insulin. However, we must remember that the investigators used ether, which, in itself, produces marked metabolic changes. Second, it must be remembered that the adrenals are not the only source of adrenergic substances and that accessory adrenal tissue frequently is present[8]. Cannon, McIver and Bliss[9] showed quite definitely that injection of insulin results in a sympathetic discharge in the body resembling the action of adrenalin, such as erection of hairs, dilatation of pupil, increased pulse rate and increased blood pressure. They also believe that the convulsions are due to sympathetic stimulation by adrenalin. Wilder at the Mayo Clinic reported that the subjective symptoms he had following an injection of insulin on himself were very similar to those following an injection of adrenalin.[10] Boothby and Wilder[4] believe that adrenalin plays a role in insulin symptomatology. When observing patients in hypoglycemia one is impressed by the evidence of sympathetic or adrenergic activity such as pallor, shivering, profuse sweating and dilatation of pupils. The two most prominent pharmacological effects of adrenalin are vasoconstriction and increased blood pressure. We have already observed (Chart I), the progressive lowering of skin temperature during the course of hypoglycemia which is evidence of peripheral vasoconstriction. Let us now study the course of the blood pressure during the treatment. Chart II is a composite picture of the systolic and diastolic pressures of 15 cases, starting with their normal readings after one hour rest in bed and recorded subsequently at half-hour intervals following the injection of insulin. The systolic pressure rises progressively throughout the treatment and begins to decline again toward the end of the treatment period or following interruption with glucose. The diastolic pressure does not display the marked change observed in the case of systolic pressure. In some cases it rises quite abruptly; in others there is just as precipitous a decline, and in still others it shows little change. These findings are quite in accord with the normal action of adrenalin which will be shown in the following study.

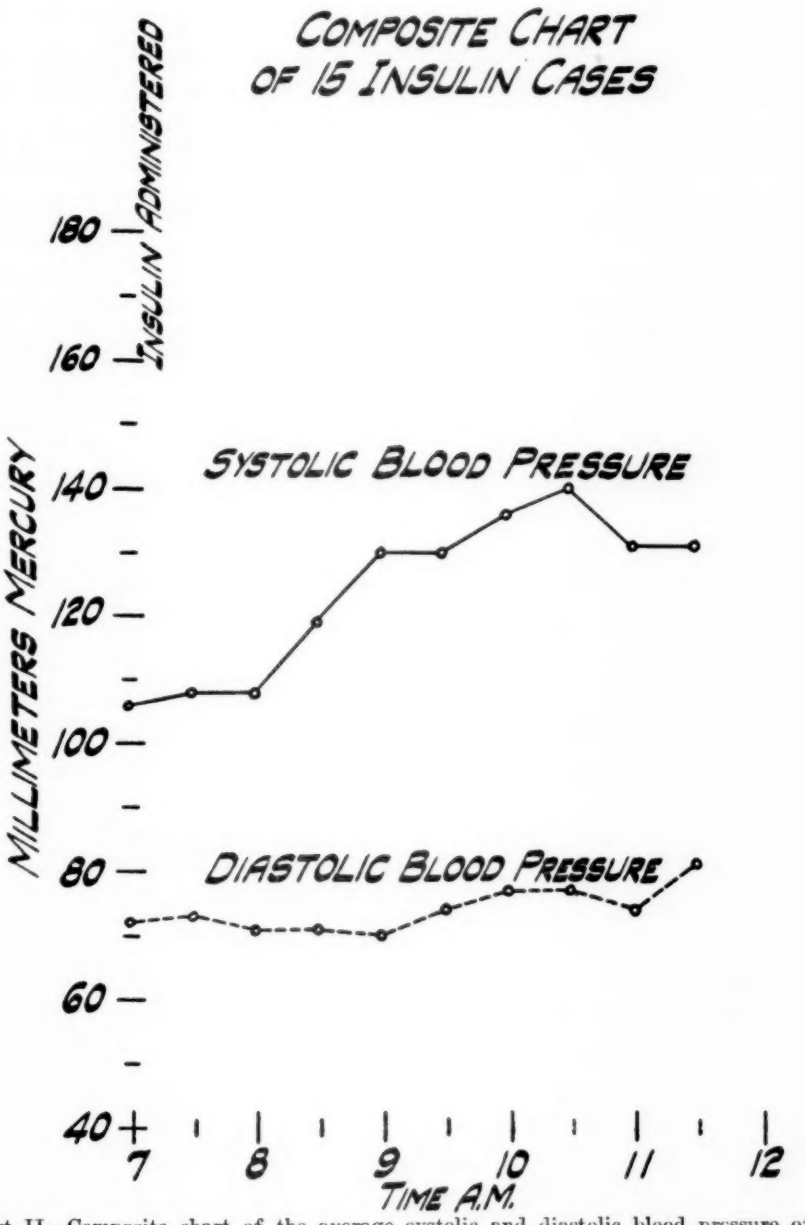

Chart II—Composite chart of the average systolic and diastolic blood pressure of 15 insulin cases showing the adrenalin-like action of insulin on the blood pressure causing a progressive increase of systolic blood pressure but a less marked effect on diastolic pressure with frequent decrease in the latter.

TABLE 2. Tabulated results of adrenalin administration to twenty-five cases not treated with insulin, showing rectal and mouth temperatures, pulse and blood pressure readings before and after the administration of the drug. It also shows that increased perspiration is commonly present after adrenalin administration.

	Before epinephrine				After epinephrine						
Patient No.	R	M	P	BP	R	M	P	BP	Age	Diagnosis	*Remarks*
1	98.9	98.3	64	88/64	98.4	98.0	68	118/74	26	D. P. Heb.	Pallor
2	98.4	97.5	60	130/88	98.6	98.2	68	120/68	27	D. P. Cat.	Perspiring
3	99.5	98.6	60	88/62	99.2	98.4	56	112/60	33	D. P. Par.	Pallor
4	98.3	97.7	60	118/76	98.2	97.8	60	94/40	25	D. P. Heb.	Pallor
5	100.2	99.3	76	116/68	100.2	99.0	88	128/56	32	D. P. Heb.	Perspiring—Pallor
6	98.3	97.9	84	100/62	98.3	97.9	96	128/66	31	D. P. Heb.	Marked shivering
7	98.6	98.4	96	114/80	98.5	98.4	100	98/54	31	D. P. Heb.	Perspiring—Pallor
8	98.6	97.5	66	108/72	98.6	...	72	180/92	29	D. P. Cat.	Pallor
9	99.1	97.9	82	94/68	99.0	97.7	104	106/54	29	D. P. Cat.	Perspiring
10	99.5	98.5	80	118/88	99.0	98.4	100	120/76	34	D. P. Simple	Perspiring
11	98.4	97.4	80	120/80	98.3	97.3	88	132/70	37	D. P. Heb.	Perspiring
12	99.4	98.4	56	102/74	98.8	97.6	64	109/40	25	D. P. Par.	Pallor
13	98.8	98.1	64	88/64	98.7	98.0	66	104/50	31	D. P. Cat.	Perspiring
14	98.1	97.7	60	114/80	98.1	97.7	68	114/58	39	D. P. Heb.	Perspiring
15	98.4	97.4	68	102/58	98.4	97.4	64	140/44	29	D. P. Par.	Perspiring
16	99.1	97.8	100	134/80	99.3	98.7	120	156/60	24	D. P. Heb.	Perspiring
17	98.5	97.4	70	104/64	98.2	97.2	74	126/68	37	D. P. Par.	Perspiring
18	98.8	98.4	72	94/66	98.4	97.8	76	128/80	32	D. P. Heb.	Perspiring
19	99.2	98.7	76	82/44	99.1	98.2	96	118/60	26	D. P. Heb.	Perspiring
20	99.0	...	72	116/80	98.6	...	90	176/90	32	D. P. Heb.	Perspiring
21	98.7	98.2	62	126/74	98.7	98.0	72	108/36	27	D. P. Heb.	Pallor
22	98.4	98.0	60	84/54	98.6	98.0	68	120/70	29	D. P. Cat.	Perspiring—Shivering
23	98.6	97.4	72	102/66	98.6	96.8	82	140/70	44	D. P. Simple	Perspiring
24	98.3	...	74	106/64	98.0	97.1	86	112/54	32	D. P. Heb.	Perspiring
25	99.1	98.6	60	104/68	98.8	98.3	80	104/58	33	D. P. Par.	Perspiring

To determine whether adrenalin alone will produce the lowered rectal temperature and the same blood pressure changes observed in insulin hypoglycemia, 25 cases of dementia præcox not receiving insulin treatment were studied. The choice of patients was rather indiscriminate except that only patients with no marked evidence of cardiovascular disease were treated. Each patient remained in bed two or three hours prior to treatment so that a normal and stabilized blood pressure, and rectal and mouth temperature readings could be obtained. The temperatures were taken with accurately calibrated mercury thermometers, the same thermometer being used on the same patient before and after treatment. The rectal thermometer was inserted about five centimeters and about five minutes were allowed for registration. Following the initial reading, each patient received 1 c.c. of 1-1000 epinephrine, (.001 gm.) subcutaneously and the site of injection thoroughly massaged. Blood pressure and temperature readings were taken at the expiration of five minutes. It was discovered that although the maximum blood pressure effect occurs within three or five minutes following the injection, it generally takes about eight or ten minutes for the maximum temperature change to occur. Table 2 shows the readings as obtained on these cases. Most of the patients showed an increased perspiration contrary to the general opinion that the sweat glands, though supplied by the sympathetic nervous system, are not stimulated by adrenalin. It is the author's opinion that adrenalin does stimulate the sweat glands but that due to the marked vasoconstriction and diminution of blood supply to the skin area the sweating is not always apparent.

Chart III shows graphically the effect of adrenalin on systolic and diastolic blood pressures. Most of the patients showed a dramatic rise in the systolic blood pressure, but the diastolic reaction was more erratic, in many cases showing a tendency to decrease. This reaction is similar to that found during the insulin treatment.

Chart IV shows the effect of adrenalin on rectal and mouth temperatures and on the pulse. Although the effect on the temperature is not as marked as on the blood pressure, there is a definite lowering of temperature in most cases, one being lowered .6° F. within a few minutes. Only two cases showed a slight rise in temperature. The pulse is almost invariably increased in rate but some showed no change and only two displayed a decrease.

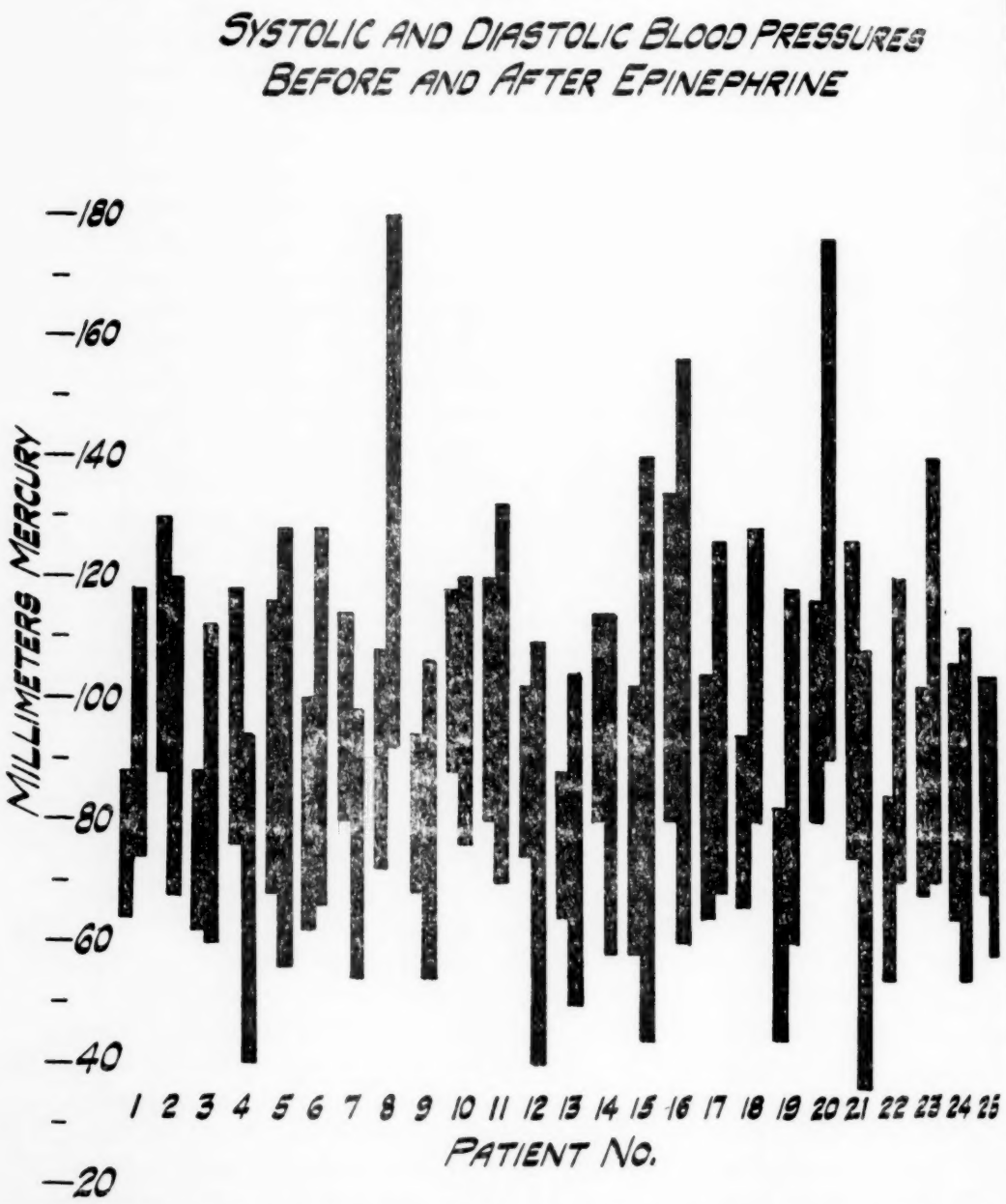

Chart III—Showing the blood pressure changes after administration of adrenalin to untreated cases and the similarity between this reaction and that occurring in insulin administration. The upper limits of the graph represent systolic blood pressure and lower limits diastolic blood pressure. The adjacent readings for each patient represent before and after treatment. There is generally a marked rise in systolic blood pressure but a rather uneven diastolic reaction with frequent lowering of the latter.

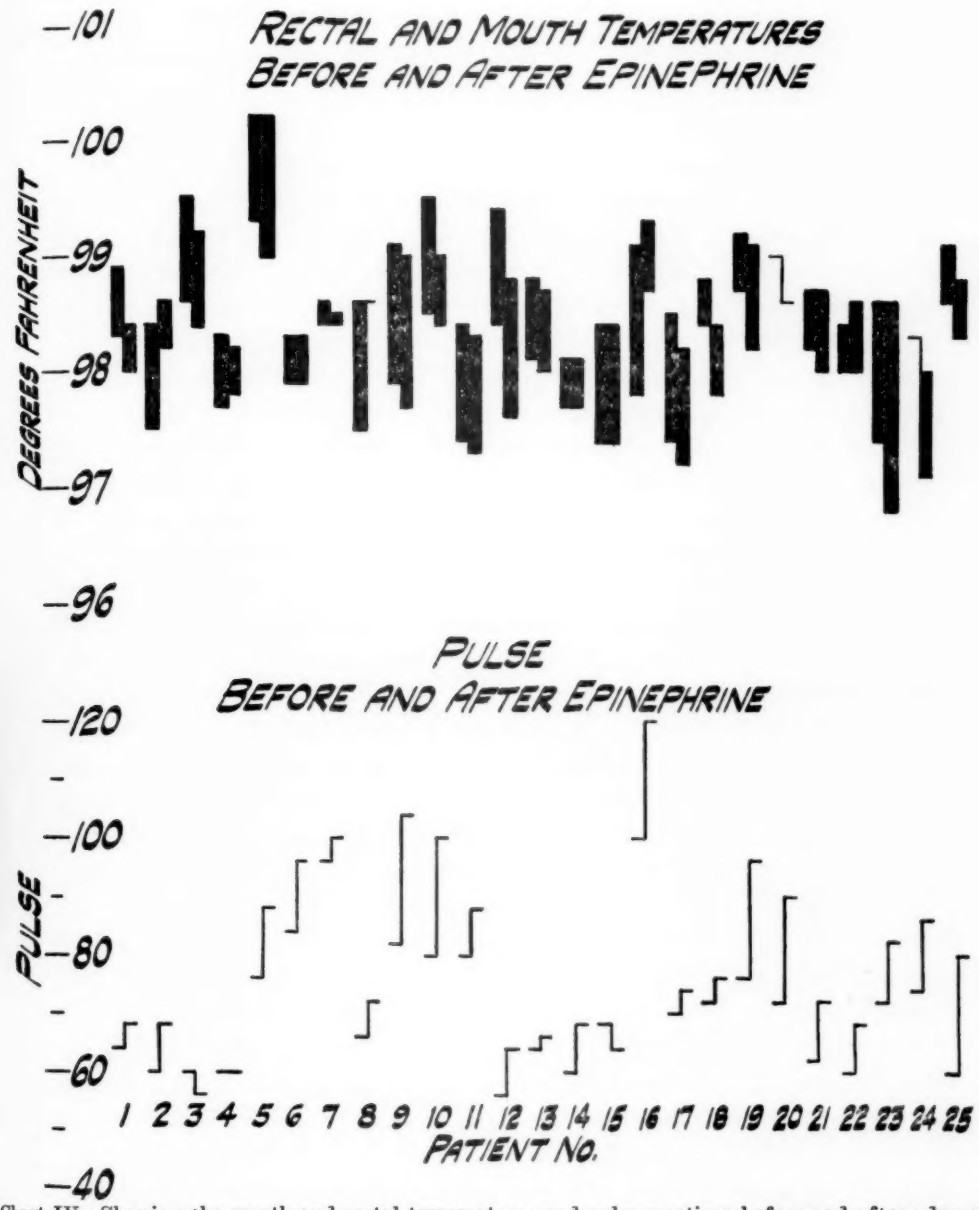

Chart IV—Showing the mouth and rectal temperatures and pulse reactions before and after adrenalin administration in 25 untreated cases. Upper limits of graph represent rectal temperature, lower limits of graph mouth temperatures. The adjacent readings for each patient represents before and after treatment. There is a definite reduction in the rectal and frequently in the mouth temperature shortly after adrenalin administration. The pulse is similarly increased.

Discussion

Considering the fact that the adrenalin was given subcutaneously and in relatively small doses, the drop in rectal temperature in some of the cases is of considerable significance. The experiment does not duplicate the true condition existing in insulin hypoglycemia. In the case of the insulin treatment, unlike the single rapidly acting and rapidly dissipated dose of adrenalin administered experimentally, there is undoubtedly a steadily progressive increase in blood adrenalin so that any resulting symptoms would necessarily be of a gradually increasing or decreasing type, as shown by our skin temperatures, rectal temperatures and blood pressure graphs. Sapegno and Ceruti[11] have shown in animal experimentation that small doses of insulin produce only slight modification in rectal temperature whereas larger doses result in a more profound lowering of temperature. This finding works in well with the adrenalin concept. The fact that the rectal temperature was not as markedly depressed following a single injection of adrenalin as it is during the four-hour hypoglycemic treatment is of little consequence. In the first place we cannot gauge the actual amount of blood adrenalin increase during the treatment and it may be quite considerable. Second, the longer duration of the vasoconstriction would allow for additional cooling of the tissues which, of course, would not take place with a single rapidly acting dose. It has been shown by Cannon and his coworkers that the secretion of adrenalin plays an important role in fear, pain and rage. It is the mobilizing secretion of the body and an animal confronted by a situation in which fight or flight is essential must immediately withdraw its blood supply from relatively unimportant depots, such as the skin and the gastrointestinal tract, in order to more effectively handle the emergency. We, therefore, find the marked vasoconstriction of the skin, with the accompanying lowered skin temperature, and for similar reasons the lower rectal and mouth temperatures. The sudden lowering of the temperature in syncope and in shock may conceivably be governed by similar mechanisms, for it is difficult to believe that any marked disturbance in heat regulation could occur in such short periods of time. In the latter instances, however, the effect, although due to

vascular changes, is apparently not dependent on adrenalin, for the blood pressure is unusually low.

Conclusions

1. The low rectal temperature in hypoglycemia cannot be adequately explained by a disturbance in the heat regulating mechanism of the body.
2. Patients in hypoglycemia present many symptoms indicative of sympathetic or adrenalin stimulation, such as pallor, dilated pupils, shivering or convulsive-like movements, increased blood pressure, and perspiration.
3. It is logical to deduce that the low rectal temperature may also be an indication of adrenalin activity, for it is known that the temperature of a part is dependent on its blood supply and in the presence of a marked vasoconstriction a definite lowering of temperature results.
4. Adrenalin administered to cases not receiving insulin produced symptoms resembling those found in insulin cases, including the lowered rectal temperature.
5. It is at present difficult to evaluate the role of other glands of internal secretion during the hypoglycemic state, although it may be a considerable factor in the results of the treatment.

References

1. Dünner, L.: Effect of insulin on body heat. Klin. wchnschr., 13:22-23, Jan. 6, 1934.
2. Fog, M.: General acquired anhidrosis. J. A. M. A., 107:25, 20-40, Dec. 19, 1936.
3. Reiter, G.: Blood sugar and respiratory metabolism following injection of insulin in nondiabetic persons; (study of relation between constitution and metabolism), Ztschr. f. klin. med., 125:605-622, 1933.
4. Boothby, W. M., and Wilder, R. M.: Preliminary report on the effect of insulin on the rate of heat production and its significance in regard to the calorigenic action of adrenalin. Med. Clin. of N. America, July, 1923.
5. Wright, Samson: Applied Physiology, 4th edition, p. 451, Oxford Univ. Press, 1932
6. Stewart, G. N., and Rogoff, J. M.: Effect of insulin upon morphine hyperglycemia. Am. J. Physiology, 65-331, 1923.
7. Stewart, G. N., and Rogoff, J. M.: Action of insulin on adrenalectomized rabbits. Am. J. Physiology, 65-342, 1923.
8. Starling's Human Physiology. P. 952, 5th edition, 1930. Lea and Febiger.
9. Cannon, W. B., McIver, M., and Bliss, S. W.: Effect of the blood sugar level on adrenal secretion and sympathetic activity (preliminary note). Boston Med. and Surg. J., July, 1923.
10. Ibid.
11. Sapegno, N., and Ceruti, G.: Archivio di scienze biologiche, V. 17, 1932.

OUTCOME OF INSULIN TREATMENT OF ONE THOUSAND PATIENTS WITH DEMENTIA PRAECOX*

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Hypoglycemic treatment of dementia præcox was experimented with by Dr. Manfred Sakel between 1928 and 1933, after his observation of certain startling psychological changes in morphine addicts who had been treated with doses of insulin. In several cases deep hypoglycemia had occurred accidentally. The results suggested to Dr. Sakel that shock therapy might be applicable to patients with mental disease, especially those with dementia præcox. The following years were devoted to the perfection of the technique of hypoglycemic therapy, and the beginning of its serious application may be set in October, 1933.[1] In a report to the New York Academy of Medicine on January 12, 1937, Dr. Sakel summarized the results of treatment of his first one hundred cases of dementia præcox. He found that where the duration of the disease did not exceed six months, 70 per cent of the patients had full remissions and were able to return to their former work, and that an additional 18 per cent had good remissions. "In all other cases, that is all cases of over six months duration, the results vary in direct relation to the duration of the illness. Forty-seven per cent of the cases showed good remissions with capacity to work, of which 19 per cent were full remissions."[2] These results Dr. Sakel compared with spontaneous remissions among untreated patients, varying from 5 to 20 per cent.

Similar results have since been reported by many investigators. While the concordance of such opinion must be given great weight in determining the efficacy of hypoglycemic treatment, the statistical proof nevertheless seems lacking in desirable rigor. Few investigators have reported on as many as 100 cases, and in

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I wish to acknowledge the invaluable assistance of Dr. Horatio M. Pollock, director of mental hygiene statistics, in the preparation of the plans for this study, and for constant advice with respect to the analysis. Dr. Frederick W. Parsons, former Commissioner of Mental Hygiene, and Dr. William J. Tiffany, the present Commissioner, both lent effective encouragement to the study. Acknowledgment is also made of the cooperation of the superintendents of the several State hospitals, who provided the data without which this study would have been impossible.

any such statistical series the probable errors of the results are high. To combine such series into a large total is dangerous statistical procedure, unless we know that the patients in the several groups are comparable with respect to such important factors as age, duration of the disease, type of dementia præcox, etc. The problem is further complicated by the necessity of obtaining an adequate control series.

In the following discussion we are able to present, I believe for the first time, an analysis of the outcome of hypoglycemic therapy in a large series of cases. The presence of Dr. Sakel in the United States was a propitious circumstance, and with his usual foresight Dr. Frederick W. Parsons, then Commissioner of the Department of Mental Hygiene, took advantage of the opportunity to have insulin shock treatment introduced into the New York civil State hospitals under the very eyes of its great exponent. Dr. Sakel was invited to give instructions in such therapy to a group of selected physicians from the several State hospitals, and for six weeks, beginning December 8, 1936, such instruction was given daily at the Harlem Valley State Hospital. Despite the fact that the patients selected for the treatment were all considered to offer a poor prognosis, Dr. John R. Ross, superintendent, reported the outcome as highly satisfactory. Hypoglycemic therapy was then undertaken in the other hospitals.[3] Foreseeing the need of a careful record of the results of treatment, a statistical schedule was prepared in the spring of 1937 with the authorization and advice of Dr. Parsons, and the hospitals were requested to forward to the central statistical bureau of the department a schedule for each patient who had completed the course of treatment. It was felt that if we examined the outcome of treatment in approximately one thousand cases, the results would be sufficiently stable to serve as norms. The following analysis is based upon the histories of 1,039 patients with dementia præcox who were treated with insulin in the several civil State hospitals. It is well to point out that the reporting was done with definite standards in mind, as these are defined in the Statistical Guide published by the Department of Mental Hygiene and by the National Committee for Mental Hygiene.[4]

TABLE 1-a. OUTCOME OF INSULIN TREATMENT OF DEMENTIA PRÆCOX PATIENTS IN NEW YORK CIVIL STATE HOSPITALS, 1937

State hospitals	Total			Recovered			Much improved			Improved			Unimproved			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Binghamton	20	29	49	4	5	9	8	9	17	3	5	8	5	10	15	..	..	..
Brooklyn	88	89	177	30	15	45	22	23	45	17	31	48	18	20	38	1	..	1
Buffalo	41	26	67	3	2	5	18	8	26	13	8	21	7	8	15	..	..	..
Central Islip	39	37	76	2	3	5	14	10	24	9	3	12	12	21	33	2	..	2
Creedmoor	23	15	38	3	3	6	6	4	10	8	3	11	6	5	11	..	..	..
Gowanda	13	19	32	6	7	13	5	6	11	1	3	4	..	2	2	1	1	2
Harlem Valley	48	46	94	5	8	13	18	13	31	20	7	27	5	18	23	..	..	..
Hudson River	44	31	75	1	1	2	5	..	5	8	13	21	28	16	44	2	1	3
Kings Park	18	39	57	..	1	1	7	13	20	2	9	11	9	15	24	..	1	1
Manhattan	18	7	25	..	..	..	3	3	6	8	2	10	6	1	7	1	1	2
Marcy	13	12	25	1	..	1	7	4	11	3	2	5	2	5	7	..	1	1
Middletown	7	11	18	..	1	1	2	1	3	..	2	2	5	7	12	..	..	..
Pilgrim	14	24	38	..	..	..	2	6	8	5	11	16	7	7	14	..	..	..
Psychiatric Institute	28	34	62	4	13	17	2	6	8	5	2	7	17	13	30	..	..	..
Rochester	24	24	48	..	..	..	14	5	19	4	11	15	6	8	14	..	..	..
Rockland	29	18	47	..	..	..	7	5	12	9	5	14	13	8	21	..	..	..
St. Lawrence	17	31	48	2	2	4	7	5	12	5	6	11	3	18	21	..	..	..
Utica	17	16	33	8	..	8	2	2	4	4	4	8	3	9	12	..	1	1
Willard	24	6	30	2	2	4	9	1	10	9	3	12	4	..	4	..	..	..
Total	525	514	1,039	71	63	134	158	124	282	133	130	263	156	191	347	7	6	13

Table 1-a shows the number of patients in each of the several hospitals who had received treatment with insulin, and for whom schedules describing the outcome of treatment had been received by March 1, 1938. Of the 1,039 patients, 525, or 50.5 per cent, were males, and 514, or 49.5 per cent, females. Brooklyn State Hospital treated the largest total of such patients, namely 177. Harlem Valley followed with 94 cases. Central Islip and Hudson River reported 76 and 75 cases, respectively.

Of the 1,039 patients, 134, or 12.9 per cent, were reported as recovered after the completion of treatment; 282, or 27.1 per cent, were much improved; and 263, or 25.3 per cent, were improved. A total of 679, or 65.4 per cent, thus showed some degree of improvement after treatment with insulin. Three hundred and forty-seven patients, or 33.4 per cent, showed no improvement. "Condition of the patient" refers to a period approximately one month after the close of insulin treatment. Thirteen patients died during treatment. Sex differences occurred as follows: the recovery rates were 13.5 and 12.3 per cent, for males and females, respectively. Combining all degrees of improvement, we find that 69.0 per cent of the males showed some degree of improvement, compared with 61.7 per cent of the females. Rates of recovery and improvement varied widely in the several hospitals, but this was due in large part to differences in the types of patients under treatment.

Now, the crucial point is in the comparison of the outcome of treatment among insulin-treated patients with that of a corresponding group of patients who had not received such therapy. The control group consisted of 1,039 first admissions with dementia præcox to the New York civil State hospitals, almost all of whom were admitted during the year July 1, 1935 through June 30, 1936. This period was selected in order that each patient in the control group would have been under observation for at least one year. As we were able to trace the institutional histories of these patients up to June 30, 1937, it will be seen that the period of observation was in fact nearer two years for the majority of the control series. The latter were matched with the insulin-treated group, so as to maintain the same total for each hospital,

TABLE 1-b. OUTCOME OF TREATMENT OF DEMENTIA PRÆCOX FIRST ADMISSIONS TO NEW YORK CIVIL STATE HOSPITALS
JULY 1, 1935 TO JUNE 30, 1936

State hospitals	Total			Recovered			Much improved			Improved			Unimproved			Still in hospital			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Binghamton	20	29	49	..	1	1	7	2	9	2	1	3	3	1	4	8	22	30	..	2	2
Brooklyn	88	89	177	4	6	10	14	16	30	8	7	15	3	1	4	47	53	100	12	6	18
Buffalo	41	26	67	2	4	6	8	4	12	2	1	3	2	..	2	27	15	42	..	2	2
Central Islip	39	37	76	..	..	..	8	4	12	1	5	6	1	1	2	28	26	54	1	1	2
Creedmoor	23	15	38	..	1	1	..	2	2	..	1	1	..	..	..	21	11	32	2	..	2
Gowanda	13	19	32	3	1	4	..	1	1	..	..	..	1	3	4	9	13	22	..	1	1
Harlem Valley	48	46	94	1	3	4	2	3	5	2	1	3	2	3	5	40	35	75	1	1	2
Hudson River	44	31	75	1	..	1	5	1	6	3	3	6	7	1	8	26	22	48	2	4	6
Kings Park	18	39	57	..	1	1	1	6	7	1	3	4	2	2	4	14	27	41	..	..	..
Manhattan	18	7	25	..	..	..	..	..	..	4	1	5	..	..	..	13	6	19	1	..	1
Marcy	13	12	25	..	..	..	7	1	8	1	..	1	..	1	1	5	10	15	..	..	..
Middletown	7	11	18	..	..	..	1	1	2	1	1	2	..	..	..	4	8	12	1	1	2
Pilgrim	14	24	38	..	1	1	3	..	3	1	4	5	..	1	1	9	16	25	1	2	3
Psychiatric Institute	28	34	62	..	2	2	2	1	3	4	3	7	17	18	35	5	10	15	..	..	..
Rochester	24	24	48	..	..	..	5	..	5	..	4	4	1	..	1	17	20	37	1	..	1
Rockland	29	18	47	1	..	1	3	3	6	5	3	8	..	..	..	19	11	30	1	1	2
St. Lawrence	17	31	48	..	..	..	..	1	1	..	..	..	1	4	5	14	26	40	2	..	2
Utica	17	16	33	3	..	3	2	..	2	1	3	4	..	1	1	11	12	23	..	..	..
Willard	24	6	30	1	..	1	2	..	2	..	..	..	1	..	1	19	5	24	1	1	2
Total	525	514	1,039	16	20	36	70	46	116	36	41	77	41	37	78	336	348	684	26	22	48

in the same sex proportion, and with the same distribution of types of dementia præcox. We now find that 3.5 per cent of the control group were discharged as recovered, 11.2 per cent as much improved, and 7.4 per cent as improved. Some degree of improvement was therefore shown by 22.1 per cent of the control group, compared with 65.4 per cent in the insulin-treated group. In other words, the rate of improvement in the insulin-treated group exceeded that in the control group in the ratio of 2.96 to 1, or by 196 per cent. The difference between these percentages is in overwhelming excess of its probable error (43.3 ± 4.2). The difference is all the more significant in view of the fact that the control group consisted entirely of first admissions, among whom the disease was less chronic than in the case of the insulin-treated group, many of whom had already spent years in the hospitals. Consider the individual degrees of improvement: the insulin group included 12.9 per cent of recoveries as against only 3.5 per cent in the control group, a difference of 9.4 ± 0.79. The much improved groups included 27.1 and 11.2 per cent, respectively, a difference of 15.9 ± 1.1. The groups characterized as improved showed a difference of 17.9 ± 1.2 per cent, in favor of the insulin-treated group.

Two further comments are necessary with respect to the outcome of treatment. It will be noted that of the control group, 684, or 65.8 per cent, were still in the hospital. All in this group were considered to be unimproved. This will not affect the comparisons with respect to rates of recovery and high degrees of improvement, for we are justified in assuming that all patients in the control group showing such degrees of improvement had been paroled or discharged. This is not true, however, of the category described as "improved." It is possible that among those still in the hospital there were a small number who showed signs of improvement. This total could hardly exceed that already classified as improved, however, so that, even if we doubled the rate of improvement in the control group, this would still be significantly less than the corresponding rate in the insulin group. Objection may also be raised on the ground that the categories of improvement are dependent upon subjective evaluations, and are therefore liable to large per-

TABLE 1-c. PER CENT DISTRIBUTION OF OUTCOME OF TREATMENT OF DEMENTIA PRÆCOX PATIENTS IN NEW YORK CIVIL STATE HOSPITALS

State hospitals	Insulin-treated patients					Control group					
	Recovered	Much improved	Improved	Unimproved	Died	Recovered	Much improved	Improved	Unimproved	Still in hospital	Died
Binghamton	18.4	34.7	16.3	30.6	....	2.0	18.4	6.1	8.2	61.2	4.1
Brooklyn	25.4	25.4	27.1	21.5	0.6	5.6	16.9	8.5	2.3	56.5	10.2
Buffalo	7.5	38.8	31.3	22.4	....	9.0	17.9	4.5	3.0	62.7	3.0
Central Islip	6.6	31.6	15.8	43.4	2.6	....	15.8	7.9	2.6	71.1	2.6
Creedmoor	15.8	26.3	28.9	28.9	....	2.6	5.3	2.6	....	84.2	5.3
Gowanda	40.6	34.4	12.5	6.3	6.3	12.5	3.1	....	12.5	68.8	3.1
Harlem Valley	13.8	33.0	28.7	24.5	....	4.3	5.3	3.2	5.3	79.8	2.1
Hudson River	2.7	6.7	28.0	58.7	4.0	1.3	8.0	8.0	10.7	64.0	8.0
Kings Park	1.8	35.1	19.3	42.1	1.8	1.8	12.3	7.0	7.0	71.9	....
Manhattan	...	24.0	40.0	28.0	8.0	....	....	20.0	....	76.0	4.0
Marcy	4.0	44.0	20.0	28.0	4.0	....	32.0	4.0	4.0	60.0	....
Middletown	5.6	16.7	11.1	66.7	....	....	11.1	11.1	....	66.7	11.1
Pilgrim	...	21.1	42.1	36.8	....	2.6	7.9	13.2	2.6	65.8	7.9
Psychiatric Institute	27.4	12.9	11.3	48.4	....	3.2	4.8	11.3	56.5	24.2	....
Rochester	...	39.6	31.2	29.2	....	....	10.4	8.3	2.1	77.1	2.1
Rockland	...	25.5	29.8	44.7	....	2.1	12.8	17.0	....	63.8	4.3
St. Lawrence	8.3	25.0	22.9	43.7	....	....	2.1	....	10.4	83.3	4.2
Utica	24.2	12.1	24.2	36.4	3.0	9.1	6.1	12.1	3.0	69.7	....
Willard	13.3	33.3	40.0	13.3	....	3.3	6.7	....	3.3	80.0	6.7
Total	12.9	27.1	25.3	33.4	1.3	3.5	11.2	7.4	7.5	65.8	4.6

sonal errors. For this reason, it is perhaps better to combine all degrees of improvement into one category, as was done in the preceding section. However, I deem the individual comparisons of real significance since the evaluation of the patient's condition was made by the same observers, using the same criteria for both groups. Any error is therefore likely to be constant for the two groups.

We have yet to consider the matter of deaths. Hypoglycemic therapy is a very delicate procedure, and its control requires a high degree of skill and attention on the part of the practitioner. Is the resultant risk to the patient too high? Among the 1,039 patients treated with insulin there were 13 deaths, a rate of 12.5 per 1,000 under treatment. Among the control group there were 48 deaths, a rate of 46.2 per 1,000. The latter rate is in excess in the ratio of 3.7 to 1. Two factors must be considered in connection with these death rates, however. In the first place, the time interval included in the observation of the control series was greatly in excess of that of the insulin group. Naturally, the longer the exposure, the greater is the risk of death, other things being equal. Were both groups observed during equal periods of time there would undoubtedly be a relative reduction in the number of deaths among the control group. The death rates were also influenced by the presence among the control group of patients whose physical condition was such as to preclude the possibility of insulin therapy. This is especially evident in the case of Brooklyn State Hospital where there were 18 deaths in the control group. With respect to physical factors, therefore, the insulin-treated patients were undoubtedly a selected group. If corrections for such selection could be made, I am of the opinion that the death rates of the two groups of patients would prove to be of a comparable order. From this it follows that if the administration of shock therapy is carried out under carefully supervised conditions, the resultant risk of death will not prove greater than that to which a patient with dementia præcox is subject in the ordinary course of the disease.

TABLE 2-a. OUTCOME OF INSULIN TREATMENT ACCORDING TO TYPE OF DEMENTIA PRÆCOX

Types	Total			Recovered			Much improved			Improved			Unimproved			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
								Number										
Simple	17	7	24	..	1	1	9	1	10	6	3	9	2	2	4	..	..	..
Hebephrenic	98	108	206	9	4	13	25	28	53	23	20	43	41	54	95	..	2	2
Catatonic	153	203	356	30	32	62	41	50	91	37	59	96	43	62	105	2	..	2
Paranoid	254	194	448	31	26	57	82	44	126	67	48	115	69	72	141	5	4	9
Others and unclassified	3	2	5	1	..	1	1	1	2	..	..	..	1	1	2	..	..	..
Total	525	514	1,039	71	63	134	158	124	282	133	130	263	156	191	347	7	6	13
								Per cent										
Simple	100.0	100.0	100.0	..	14.3	4.2	52.9	14.3	41.7	35.3	42.9	37.5	11.8	28.6	16.7	..	..	..
Hebephrenic	100.0	100.0	100.0	9.2	3.7	6.3	25.5	25.9	25.7	23.5	18.5	20.9	41.8	50.0	46.1	..	1.9	1.0
Catatonic	100.0	100.0	100.0	19.6	15.8	17.4	26.8	24.6	25.6	24.2	29.1	27.0	28.1	30.5	29.5	1.3	..	0.6
Paranoid	100.0	100.0	100.0	12.2	13.4	12.7	32.3	22.7	28.1	26.4	24.7	25.7	27.2	37.1	31.5	2.0	2.1	2.0
Others and unclassified	100.0	100.0	100.0	33.3	..	20.0	33.3	50.0	40.0	..	..	..	33.3	50.0	40.0	..	..	..
Total	10.0	100.0	100.0	13.5	12.3	12.9	30.1	24.1	27.1	25.3	25.3	25.3	29.7	37.2	33.4	1.3	1.2	1.3

TABLE 2-b. OUTCOME OF TREATMENT WITHOUT INSULIN ACCORDING TO TYPE OF DEMENTIA PRÆCOX

Types	Total			Recovered			Much improved			Improved			Unimproved			Still in hospital			Died		
	M.	F.	T.	T.	M.	F.	T.	M.	F.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
										Number											
Simple	17	7	24	..	2	2	6	1	7	..	2	2	1	..	1	10	2	12	..	..	..
Hebephrenic	98	108	206	1	1	2	10	6	16	7	7	14	14	15	29	64	77	141	2	2	4
Catatonic	151	204	355	12	16	28	21	26	47	9	13	22	9	5	14	88	130	218	12	14	26
Paranoid	256	193	449	2	1	3	33	13	46	20	18	38	16	17	33	173	138	311	12	6	18
Others and unclassified	3	2	5	1	..	1	..	..	..	..	1	1	1	..	1	1	1	2	..	..	..
Total	525	514	1,039	16	20	36	70	46	116	36	41	77	41	37	78	336	348	684	26	22	48
										Per cent											
Simple	100.0	100.0	100.0	..	28.6	8.3	35.3	14.3	29.2	..	28.6	8.3	5.9	..	4.2	58.8	28.6	50.0	..	..	..
Hebephrenic	100.0	100.0	100.0	1.0	0.9	1.0	10.2	5.6	7.8	7.1	6.5	6.8	14.3	13.9	14.1	65.3	71.3	68.4	2.0	1.9	1.9
Catatonic	100.0	100.0	100.0	7.9	7.8	7.9	13.9	12.7	13.2	6.0	6.4	6.2	6.0	2.5	3.9	58.3	63.7	61.4	7.9	6.9	7.3
Paranoid	100.0	100.0	100.0	0.8	0.5	0.7	12.9	6.7	10.2	7.8	9.3	8.5	6.3	8.8	7.3	67.6	71.5	69.3	4.7	3.1	4.0
Others and unclassified	100.0	100.0	100.0	33.3	..	20.0	..	..	..	..	50.0	20.0	33.3	..	20.0	33.3	50.0	40.0	..	..	..
Total	100.0	100.0	100.0	3.0	3.9	3.5	13.3	8.9	11.2	6.9	8.0	7.4	7.8	7.2	7.5	64.0	67.7	65.8	5.0	4.3	4.6

Our next task is to inquire into the correlation of outcome of treatment with other factors. We may start with a consideration of type of dementia præcox. (See Tables 2-a and 2-b.) Of the 1,039 patients who received insulin treatment, 24, or 2.3 per cent, were of the simple type; 206, or 19.8 per cent, were hebephrenic; 356, or 34.3 per cent, were catatonic; and 448, or 43.1 per cent, belonged to the paranoid type. Five patients were unclassified. Disregarding the simple type because of the small frequency, we find percentages of recovery as follows: hebephrenic, 6.3; catatonic, 17.4; and paranoid, 12.7. Combining all degrees of improvement, we find the following percentages: hebephrenic, 52.9; catatonic, 70.0; and paranoid, 66.5. Clearly the catatonic and paranoid types are more responsive to insulin treatment than the hebephrenic. The catatonic type appears to respond somewhat better than the paranoid, though the difference (3.5 ± 2.4 per cent) is hardly significant, statistically. We find the same hierarchy in the control series. Combined degrees of improvement were as follows: hebephrenic, 15.6; catatonic, 27.3; and paranoid, 19.4 Combined rates of improvement in the insulin-treated group exceeded those in the control series in the following ratios: hebephrenic, 3.4 to 1; catatonic, 2.6 to 1; paranoid, 3.4 to 1.

Tables 3-a and 3-b consider the relation of age at beginning of treatment to outcome of treatment. Among the control group age at first admission is considered equivalent to age at beginning of treatment. In both groups of patients the rate of recovery was relatively high at the younger ages, and showed a tendency to decline with advancing age. This is more marked, however, in the control group. In the insulin-treated group, the combined rates of improvement, which were 67.0 per cent at 15 to 19 years and 68.1 per cent at 20 to 24 years, declined to 62.7 per cent at 35 to 39 years and 63.2 per cent at 40 to 44 years. At corresponding ages in the control group the percentages were 32.8, 28.7, 15.1 and 16.2, respectively. It appears that age at beginning of treatment is of less significance under insulin treatment than among untreated cases.

TABLE 3-a. OUTCOME OF INSULIN TREATMENT ACCORDING TO AGE AT BEGINNING OF TREATMENT

Age group, (years)	Total			Recovered			Much improved			Improved			Unimproved			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Number																		
Under 10	2	..	2	..	..	..	..	..	..	..	..	..	2	..	2	..	..	..
10-14	4	3	7	..	..	..	2	..	2	..	1	1	2	2	4	..	..	..
15-19	49	48	97	11	7	18	14	12	26	9	12	21	15	17	32	..	..	..
20-24	141	110	251	19	15	34	41	34	75	38	24	62	41	37	78	2	..	2
25-29	145	145	290	17	15	32	45	37	82	36	40	76	44	51	95	3	2	5
30-34	112	111	223	15	17	32	34	25	59	26	30	56	37	39	76	..	..	..
35-39	53	65	118	6	7	13	15	11	26	20	15	35	10	29	39	2	3	5
40-44	14	24	38	3	2	5	5	5	10	3	6	9	3	10	13	..	1	1
45-49	5	7	12	..	..	..	2	..	2	1	2	3	2	5	7	..	..	..
50-54	..	1	1	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..
Total	525	514	1,039	71	63	134	158	124	282	133	130	263	156	191	347	7	6	13
Per cent																		
Under 10	100.0	100.0	100.0	..	..	..	..	..	..	..	..	..	100.0	..	100.0	..	..	..
10-14	100.0	100.0	100.0	..	..	..	50.0	..	28.6	..	33.3	14.3	50.0	66.6	57.1	..	..	..
15-19	100.0	100.0	100.0	22.4	14.6	18.6	28.6	25.0	26.8	18.4	25.0	21.6	30.6	35.4	33.0	..	..	..
20-24	100.0	100.0	100.0	13.5	13.6	13.5	29.1	30.9	29.9	27.0	21.8	24.7	29.1	33.6	31.1	1.4	..	0.8
25-29	100.0	100.0	100.0	11.7	10.3	11.0	31.0	25.5	28.3	24.8	27.6	26.2	30.3	35.2	32.8	2.1	1.4	1.7
30-34	100.0	100.0	100.0	13.4	15.3	14.3	30.4	22.5	26.5	23.2	27.0	25.1	33.0	35.1	34.1	..	..	..
35-39	100.0	100.0	100.0	11.3	10.8	11.0	28.3	16.9	22.0	37.7	23.1	29.7	18.9	44.6	33.0	3.8	4.6	4.2
40-44	100.0	100.0	100.0	21.4	8.3	13.2	35.7	20.8	26.3	21.4	25.0	23.7	21.4	41.7	34.2	..	4.2	2.6
45-49	100.0	100.0	100.0	..	..	..	40.0	..	16.7	20.0	28.6	25.0	40.0	71.4	58.3	..	..	..
50-54	100.0	100.0	100.0	..	..	..	..	..	..	..	..	..	..	100.0	100.0	..	..	..
Total	100.0	100.0	100.0	13.5	12.3	12.9	30.1	24.1	27.1	25.3	25.3	25.3	29.7	37.2	33.4	1.3	1.2	1.3

TABLE 3-b. OUTCOME OF TREATMENT WITHOUT INSULIN ACCORDING TO AGE AT FIRST ADMISSION

Age group, (years)	Total			Recovered			Much improved			Improved			Unimproved			Still in hospital			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Number																					
Under 10	..	2	2	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	..	..	..
10-14	5	3	8	..	1	1	..	..	..	1	..	1	2	2	4	2	..	2	..	..	..
15-19	58	61	119	4	5	9	10	9	19	6	5	11	6	6	12	29	34	63	3	2	5
20-24	107	81	188	3	3	6	19	13	32	7	9	16	9	6	15	66	47	113	3	3	6
25-29	88	86	174	3	6	9	10	7	17	5	7	12	6	4	10	61	60	121	3	2	5
30-34	89	76	165	3	2	5	13	5	18	5	9	14	4	8	12	58	50	108	6	2	8
35-39	69	57	126	2	2	4	7	1	8	4	3	7	9	4	13	46	43	89	1	4	5
40-44	47	52	99	1	..	1	5	4	9	3	3	6	2	3	5	32	40	72	4	2	6
45-49	28	44	72	..	1	1	2	3	5	3	3	6	1	1	2	18	35	53	4	1	5
50-54	16	26	42	..	..	..	2	3	5	1	1	2	1	3	4	11	18	29	1	1	2
55-59	15	13	28	..	..	..	2	..	2	1	1	2	1	..	1	11	10	21	..	2	2
60 and over	3	13	16	..	..	..	..	1	1	..	..	..	..	..	..	2	9	11	1	3	4
Total	525	514	1,039	16	20	36	70	46	116	36	41	77	41	37	78	336	348	684	26	22	48
Per cent																					
Under 10	100.0	100.0	100.0	..	..	..	..	..	..	..	..	..	..	..	..	..	100.0	100.0	..	..	..
10-14	100.0	100.0	100.0	..	33.3	12.5	..	..	..	20.0	..	12.5	40.0	66.7	50.0	40.0	..	25.0	..	..	..
15-19	100.0	100.0	100.0	6.9	8.2	7.6	17.2	14.8	16.0	10.3	8.2	9.2	10.3	9.8	10.1	50.0	55.7	52.9	5.2	3.3	4.2
20-24	100.0	100.0	100.0	2.8	3.7	3.2	17.8	16.0	17.0	6.5	11.1	8.5	8.4	7.4	8.0	61.7	58.0	60.1	2.8	3.7	3.2
25-29	100.0	100.0	100.0	3.4	7.0	5.2	11.4	8.1	9.8	5.7	8.1	6.9	6.8	4.7	5.7	69.3	69.8	69.5	3.4	2.3	2.9
30-34	100.0	100.0	100.0	3.4	2.6	3.0	14.6	6.6	10.9	5.6	11.8	8.5	4.5	10.5	7.3	65.2	65.8	65.5	6.7	2.6	4.8
35-39	100.0	100.0	100.0	2.9	3.5	3.2	10.1	1.8	6.3	5.8	5.3	5.6	13.0	7.0	10.3	66.7	75.4	70.6	1.4	7.0	4.0
40-44	100.0	100.0	100.0	2.1	..	1.0	10.6	7.7	9.1	6.4	5.8	6.1	4.3	5.8	5.1	68.1	76.9	72.7	8.5	3.8	6.1
45-49	100.0	100.0	100.0	..	2.3	1.4	7.1	6.8	6.9	10.7	6.8	8.3	3.6	2.3	2.8	64.3	79.5	73.6	14.3	2.3	6.9
50-54	100.0	100.0	100.0	..	..	..	12.5	11.5	11.9	6.3	3.8	4.8	6.3	11.5	9.5	68.8	69.2	69.0	6.3	3.8	4.8
55-59	100.0	100.0	100.0	..	..	..	13.3	..	7.1	6.7	7.7	7.1	6.7	..	3.6	73.3	76.9	75.0	..	15.4	7.1
60 and over	100.0	100.0	100.0	..	..	..	..	7.7	6.3	..	..	..	..	..	..	66.7	69.2	68.8	33.3	23.1	25.0
Total	100.0	100.0	100.0	3.0	3.9	3.5	13.3	8.9	11.2	6.9	8.0	7.4	7.8	7.2	7.5	64.0	67.7	65.8	5.0	4.3	4.6

More significant than age at beginning of treatment is the duration of the disease before treatment. This is shown in Tables 4-a and 4-b. Among the insulin-treated patients there was a progressive decrease in the recovery rate from 42.9 per cent when the disease was less than 1 month old, and 33.3 per cent when it was of 1 to 3 months duration, to 3.4 per cent in the group with a duration of 11 to 14 years. The downward trend is clearly evident. The combined rate of improvement was 85.8 per cent among those with a duration of less than 1 month, and 86.9 per cent among those with a duration of 1 to 3 months. The rate of improvement declined steadily with the increasing duration of the disease (except for some minor and accidental fluctuations). The control group showed a similarly declining trend in rate of improvement with a progressive increase in the duration of the disease prior to treatment. Rates of improvement were in excess in the insulin-treated group over the corresponding rates in the untreated group in ratios of approximately 3 to 1.

In Table 5 the outcome of treatment with insulin is classified according to the duration of hospital residence before the beginning of treatment. There was a significantly downward trend in the percentage of recoveries as the duration of hospital residence increased. Among those with a residence of less than 1 month the recovery rate was 27.0 per cent. There was a steady decline to 4.9 per cent among those with a duration of 1 to 2 years, and to 3.7 per cent among those with a duration of 6 to 10 years. Combining all degrees of improvement, we observe a reduction from a maximum rate of 82.5 per cent among those with a hospital residence of less than a month prior to treatment to a minimum of 29.6 per cent among those with a residence of 6 to 10 years. The results are similar to those shown in the correlation of outcome of treatment with insulin with the duration of the psychosis before treatment. A long residence is synonymous with a chronic state of the disease, and the latter does not afford a relatively happy prospect of recovery or improvement.

TABLE 4-a. OUTCOME OF INSULIN TREATMENT ACCORDING TO DURATION OF PSYCHOSIS BEFORE TREATMENT

Total duration of psychosis	Total			Recovered			Much improved			Improved			Unimproved			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
								Number										
Less than 1 month	6	1	7	3	..	3	2	..	2	..	1	1	1	..	1	..	..	..
1 to 3 months	46	53	99	15	18	33	17	18	35	6	12	18	7	5	12	1	..	1
4 to 6 months	48	44	92	10	9	19	20	17	37	10	10	20	7	8	15	1	..	1
7 to 12 months	61	58	119	10	9	19	20	25	45	11	11	22	20	13	33	..	..	..
1 to 2 years	184	184	368	25	20	45	51	37	88	54	47	101	52	79	131	2	1	3
3 to 5 years	106	102	208	5	4	9	33	17	50	29	33	62	36	48	84	3	..	3
6 to 10 years	56	53	109	2	3	5	12	8	20	16	11	27	26	27	53	..	4	4
11 to 14 years	13	16	29	1	..	1	2	2	4	4	5	9	6	8	14	..	1	1
15 to 19 years	3	1	4	..	..	..	1	..	1	2	..	2	..	1	1	..	..	..
20 years and over	2	2	4	..	..	..	..	..	..	1	..	1	1	2	3	..	..	..
Total	525	514	1,039	71	63	134	158	124	282	133	130	263	156	191	347	7	6	13
								Per cent										
Less than 1 month	100.0	100.0	100.0	50.0	..	42.9	33.3	..	28.6	..	100.0	14.3	16.7	..	14.3	..	..	..
1 to 3 months	100.0	100.0	100.0	32.6	34.0	33.3	37.0	34.0	35.4	13.0	22.6	18.2	15.2	9.4	12.1	2.2	..	1.0
4 to 6 months	100.0	100.0	100.0	20.8	20.5	20.7	41.7	38.6	40.2	20.8	22.7	21.7	14.6	18.2	16.3	2.1	..	1.1
7 to 12 months	100.0	100.0	100.0	16.4	15.5	16.0	32.8	43.1	37.8	18.0	19.0	18.5	32.8	22.4	27.7	..	..	..
1 to 2 years	100.0	100.0	100.0	13.6	10.9	12.2	27.7	20.1	23.9	23.9	25.5	27.4	28.3	42.9	35.6	1.1	0.5	0.8
3 to 5 years	100.0	100.0	100.0	4.7	3.9	4.3	31.1	16.7	24.0	27.4	32.4	29.8	34.0	47.1	40.4	2.8	..	1.4
6 to 10 years	100.0	100.0	100.0	3.6	5.7	4.6	21.4	15.1	18.3	28.6	20.8	24.8	46.4	50.9	48.6	..	7.5	3.7
11 to 14 years	100.0	100.0	100.0	7.7	..	3.4	15.4	12.5	13.8	30.8	31.3	31.0	46.2	50.0	48.3	..	6.3	3.4
15 to 19 years	100.0	100.0	100.0	..	..	..	33.3	..	25.0	66.7	..	50.0	..	100.0	25.0	..	..	..
20 years and over	100.0	100.0	100.0	..	..	..	..	..	..	50.0	..	25.0	50.0	100.0	75.0	..	..	..
Total	100.0	100.0	100.0	13.5	12.3	12.9	30.1	24.1	27.1	25.3	25.3	25.3	29.7	37.2	33.4	1.3	1.2	1.3

TABLE 4-b. OUTCOME OF TREATMENT WITHOUT INSULIN ACCORDING TO DURATION OF PSYCHOSIS BEFORE ADMISSION TO THE NEW YORK CIVIL STATE HOSPITALS

Total duration of psychosis	Total			Recovered			Much improved			Improved			Unimproved			Still in hospital			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
										Number											
Less than 1 month	88	83	171	7	7	14	15	12	27	6	6	12	7	3	10	48	51	99	5	4	9
1 to 3 months	108	99	207	6	9	15	17	13	30	8	7	15	7	8	15	61	59	120	9	3	12
4 to 6 months	57	58	115	1	2	3	7	5	12	6	5	11	5	6	11	38	38	76	..	2	2
7 to 12 months	25	22	47	..	..	..	4	1	5	3	..	3	2	3	5	16	17	33	..	1	1
1 to 2 years	82	94	176	1	..	1	11	5	16	3	9	12	9	3	12	54	72	126	4	5	9
3 to 5 years	54	65	119	..	..	..	5	3	8	4	4	8	4	7	11	38	48	86	3	3	6
6 to 10 years	36	27	63	1	..	1	3	..	3	2	3	5	1	4	5	29	19	48	..	1	1
11 to 14 years	6	8	14	..	..	..	..	..	..	1	..	1	..	..	..	5	8	13	..	..	..
15 to 19 years	6	3	9	..	..	..	1	..	1	1	..	1	..	..	..	4	3	7	..	..	..
20 years and over	5	7	12	..	..	..	..	1	1	..	1	1	1	..	1	3	3	6	1	2	3
Unascertained	58	48	106	..	2	2	7	6	13	2	6	8	5	3	8	40	30	70	4	1	5
Total	525	514	1,039	16	20	36	70	46	116	36	41	77	41	37	78	336	348	684	26	22	48
										Per cent											
Less than 1 month	100.0	100.0	100.0	8.0	8.4	8.2	17.0	14.5	15.8	6.8	7.2	7.0	8.0	3.6	5.8	54.5	61.4	57.9	5.7	4.8	5.3
1 to 3 months	100.0	100.0	100.0	5.6	9.1	7.2	15.7	13.1	14.5	7.4	7.1	7.2	6.5	8.1	7.2	56.5	59.6	58.0	8.3	3.0	5.8
4 to 6 months	100.0	100.0	100.0	1.8	3.4	2.6	12.3	8.6	10.4	10.5	8.6	9.6	8.8	10.3	9.6	66.7	65.5	66.1	..	3.4	1.7
7 to 12 months	100.0	100.0	100.0	..	..	..	16.0	4.5	10.6	12.0	..	6.4	8.0	13.6	10.6	64.0	77.3	70.2	..	4.5	2.1
1 to 2 years	100.0	100.0	100.0	1.2	..	0.6	13.4	5.3	9.1	3.7	9.6	6.8	11.0	3.2	6.8	65.9	76.6	71.6	4.9	5.3	5.1
3 to 5 years	100.0	100.0	100.0	..	..	..	9.3	4.6	6.7	7.4	6.2	6.7	7.4	10.8	9.2	70.4	73.8	72.3	5.6	4.6	5.0
6 to 10 years	100.0	100.0	100.0	2.8	..	1.6	8.3	..	4.8	5.6	11.1	7.9	2.8	14.8	7.9	80.6	70.4	76.2	..	3.7	1.6
11 to 14 years	100.0	100.0	100.0	..	..	..	..	..	..	16.7	..	7.1	..	..	..	83.3	100.0	92.9	..	..	..
15 to 19 years	100.0	100.0	100.0	..	..	..	16.7	..	11.1	16.7	..	11.1	..	..	..	66.7	100.0	77.8	..	..	..
20 years and over	100.0	100.0	100.0	..	..	..	..	14.3	8.3	..	14.3	8.3	20.0	..	8.3	60.0	42.9	50.0	20.0	28.6	25.0
Unascertained	100.0	100.0	100.0	..	4.2	1.9	12.1	12.5	12.3	3.4	12.5	7.5	8.6	6.2	7.5	69.0	62.5	66.0	6.9	2.1	4.7
Total	100.0	100.0	100.0	3.0	3.9	3.5	13.3	8.9	11.2	6.9	8.0	7.4	7.8	7.2	7.5	64.0	67.7	65.8	5.0	4.3	4.6

TABLE 5. OUTCOME OF INSULIN TREATMENT ACCORDING TO DURATION OF HOSPITAL RESIDENCE BEFORE TREATMENT

Duration of hospital residence before treatment	Total			Recovered			Much improved			Improved			Unimproved			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
								Number										
Less than 1 month	57	80	137	14	23	37	25	25	50	9	17	26	9	15	24	..	..	..
1 to 3 months	133	135	268	28	25	53	51	41	92	22	32	54	29	37	66	3	..	3
4 to 6 months	78	61	139	8	7	15	24	15	39	25	21	46	20	17	37	1	1	2
7 to 12 months	61	62	123	12	3	15	14	21	35	16	14	30	19	24	43	..	..	..
1 to 2 years	142	121	263	8	5	13	35	19	54	49	34	83	48	61	109	2	2	4
3 to 5 years	37	43	80	..	..	..	8	2	10	9	10	19	19	29	48	1	2	3
6 to 10 years	17	10	27	1	..	1	1	1	2	3	2	5	12	7	19	..	..	..
Over 10 years	..	2	2	..	..	..	..	..	..	..	..	..	..	1	1	..	1	1
Total	525	514	1,039	71	63	134	158	124	282	133	130	263	156	191	347	7	6	13
								Per cent										
Less than 1 months	100.0	100.0	100.0	24.6	28.8	27.0	43.9	31.3	36.5	15.8	21.3	19.0	15.8	15.8	17.5	..	..	..
1 to 3 months	100.0	100.0	100.0	21.1	18.5	19.8	38.3	30.4	34.3	16.5	23.7	20.1	21.8	27.4	24.6	2.3	..	1.1
4 to 6 months	100.0	100.0	100.0	10.3	11.5	10.8	30.8	24.6	28.1	32.1	34.4	33.1	25.6	27.9	26.6	1.3	1.6	1.4
7 to 12 months	100.0	100.0	100.0	19.7	4.8	12.2	23.0	33.9	28.5	26.2	22.6	24.4	31.1	38.7	35.0	..	..	..
1 to 2 years	100.0	100.0	100.0	5.6	4.1	4.9	24.6	15.7	20.5	34.5	28.1	31.6	33.8	50.4	41.4	1.4	1.7	1.5
3 to 5 years	100.0	100.0	100.0	..	..	..	21.6	4.7	12.5	24.3	23.3	23.8	51.4	67.4	60.0	2.7	4.7	3.8
6 to 10 years	100.0	100.0	100.0	5.9	..	3.7	5.9	10.0	7.4	17.6	20.0	18.5	70.6	70.0	70.4	..	..	..
Over 10 years	100.0	100.0	100.0	..	..	..	..	..	..	..	..	..	..	50.0	50.0	..	50.0	50.0
Total	100.0	100.0	100.0	13.5	12.3	12.9	30.1	24.1	27.1	25.3	25.3	25.3	29.7	37.2	33.4	1.3	1.2	1.3

TABLE 6. OUTCOME OF INSULIN TREATMENT ACCORDING TO DURATION OF TREATMENT

Duration of treatment, (days)	Total			Recovered			Much improved			Improved			Unimproved			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
							Number											
Less than 10	4	4	8	..	2	2	1	..	1	..	1	1	3	1	4	..	..	..
10 to 19	15	17	32	3	5	8	6	5	11	1	1	2	4	5	9	1	1	2
20 to 29	20	22	42	2	7	9	8	9	17	3	1	4	5	5	10	2	..	2
30 to 39	40	44	84	9	7	16	15	14	29	8	9	17	6	14	20	2	..	2
40 to 49	51	59	110	11	12	23	18	19	37	7	10	17	14	18	32	1	..	1
50 to 59	61	50	111	14	7	21	25	16	41	10	10	20	11	16	27	1	1	2
60 to 69	88	80	168	13	13	26	32	14	46	19	15	34	24	36	60	..	2	2
70 to 79	73	85	158	9	1	10	21	15	36	17	33	50	26	35	61	..	1	1
80 to 89	64	74	138	7	4	11	14	15	29	15	28	43	28	27	55	..	..	..
90 to 99	46	37	83	1	1	2	7	8	15	20	11	31	18	16	34	..	1	1
100 and over	63	42	105	2	4	6	11	9	20	33	11	44	17	18	35	..	..	..
Total	525	514	1,039	71	63	134	158	124	282	133	130	263	156	191	347	7	6	13
							Per cent											
Less than 10	100.0	100.0	100.0	..	50.0	25.0	25.0	..	12.5	..	25.0	12.5	75.0	25.0	50.0	..	..	..
10 to 19	100.0	100.0	100.0	20.0	29.4	25.0	40.0	29.4	34.4	6.7	5.9	6.3	26.7	29.4	28.1	6.7	5.9	6.3
20 to 29	100.0	100.0	100.0	10.0	31.8	21.4	40.0	40.9	40.5	15.0	4.5	9.5	25.0	22.7	23.8	10.0	..	4.8
30 to 39	100.0	100.0	100.0	22.5	15.9	19.0	37.5	31.8	34.5	20.0	20.5	20.2	15.0	31.8	23.8	5.0	..	2.4
40 to 49	100.0	100.0	100.0	21.6	20.3	20.9	35.3	32.2	33.6	13.7	16.9	15.5	27.5	30.5	29.1	2.0	..	0.9
50 to 59	100.0	100.0	100.0	23.0	14.0	18.9	41.0	32.0	36.9	16.4	20.0	18.0	18.0	32.0	24.3	1.6	2.0	1.8
60 to 69	100.0	100.0	100.0	14.8	16.3	15.5	36.4	17.5	27.4	21.6	18.8	20.2	27.3	45.0	35.7	..	2.5	1.2
70 to 79	100.0	100.0	100.0	12.3	1.2	6.3	28.8	17.6	22.8	23.3	38.8	31.6	35.6	41.2	38.6	..	1.2	0.6
80 to 89	100.0	100.0	100.0	10.9	5.4	8.0	21.9	20.3	21.0	23.4	37.8	31.2	43.8	36.5	39.9	..	..	..
90 to 99	100.0	100.0	100.0	2.2	2.7	2.4	15.2	21.6	18.1	43.5	29.7	37.3	39.1	43.2	41.0	..	2.7	1.2
100 and over	100.0	100.0	100.0	3.2	9.5	5.7	17.5	21.4	19.0	52.4	26.2	41.9	27.0	42.9	33.3	..	..	..
Total	100.0	100.0	100.0	13.5	12.3	12.9	30.1	24.1	27.1	25.3	25.3	25.3	29.7	37.2	33.4	1.3	1.2	1.3

Table 6 correlates outcome of treatment with the duration of insulin therapy. The recovery rate showed a steady decrease as the period devoted to treatment increased. Those receiving treatment for less than a month showed a recovery rate of almost 25 per cent. As the period of treatment increased to over two months the recovery rate fell rapidly to less than 10 per cent. Combining all grades of improvement, we find, on the whole, a similar tendency. Those who had been treated for sixty days or over showed an improvement rate of approximately 60 per cent, whereas those with shorter periods of treatment had an improvement rate of 70 per cent. We infer from these results that patients who respond favorably to insulin therapy tend to do so early in the course of treatment.

Table 7 shows the correlation of outcome of insulin treatment with the number of injections. The recovery rate increased from 15.0 per cent among those who had received less than 10 injections to 25.5 per cent among those who had received from 10 to 19 injections, though the former is too low because of a probably accidental fluctuation. In the remaining groups there was clearly a downward trend in the percentage of recoveries as the number of injections increased. The same result is shown when all degrees of improvement are combined. Beginning with the group receiving 20 to 29 injections there was a downward trend in the rate of improvement. We might have anticipated these results, since the number of insulin injections is correlated with the duration of treatment, and we have already shown that the rate of recovery and improvement decreased as the duration of treatment increased.

Table 8 shows the correlation of outcome of insulin treatment with the number of units of insulin per patient. The latter is obviously correlated with the number of injections and with the duration of treatment. Since the rates of recovery and improvement varied inversely with the duration of treatment and the number of injections, we should expect a similar trend with respect to the units of insulin per patient. This is shown very clearly with respect to the recovery rate. Those receiving less than 1,000 units had a recovery rate of 18.8 per cent. Those receiving from 2,000 to 4,000 units had a recovery rate of approximately 17 per cent.

TABLE 7. OUTCOME OF INSULIN TREATMENT ACCORDING TO NUMBER OF INJECTIONS OF INSULIN

Injections of insulin given	Total			Recovered			Much improved			Improved			Unimproved			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
								Number										
Less than 10	7	13	20	..	3	3	3	3	6	..	2	2	4	5	9	..	..	..
10 to 19	28	23	51	5	8	13	11	7	18	3	1	4	7	6	13	2	1	3
20 to 29	54	66	120	8	12	20	23	20	43	11	12	23	9	22	31	3	..	3
30 to 39	71	73	144	18	10	28	24	23	47	11	12	23	17	27	44	1	1	2
40 to 49	103	106	209	16	16	32	41	26	67	21	30	51	24	33	57	1	1	2
50 to 59	115	115	230	15	5	20	32	27	59	28	36	64	40	44	84	..	3	3
60 to 69	86	70	156	7	7	14	13	8	21	36	25	61	30	30	60	..	..	..
70 to 79	50	33	83	1	1	2	11	7	18	17	8	25	21	17	38	..	..	..
80 to 89	11	5	16	1	..	1	..	1	1	6	3	9	4	1	5	..	..	..
90 to 99	..	4	4	..	..	..	..	1	1	..	1	1	..	2	2	..	..	..
100 and over	..	6	6	..	1	1	..	1	1	..	..	..	..	4	4	..	..	..
Total	525	514	1,039	71	63	134	158	124	282	133	130	263	156	191	347	7	6	13
								Per cent										
Less than 10	100.0	100.0	100.0	..	23.1	15.0	42.9	23.1	30.0	..	15.4	10.0	57.1	38.5	45.0	..	..	..
10 to 19	100.0	100.0	100.0	17.9	34.8	25.5	39.3	30.4	35.3	10.7	4.3	7.8	25.0	26.1	25.5	7.1	4.3	5.9
20 to 29	100.0	100.0	100.0	14.8	18.2	16.7	42.6	30.3	35.8	20.4	18.2	19.2	16.7	33.3	25.8	5.6	..	2.5
30 to 39	100.0	100.0	100.0	25.4	13.7	19.4	33.8	31.5	32.6	15.5	16.4	16.0	23.9	37.0	30.6	1.4	1.4	1.4
40 to 49	100.0	100.0	100.0	15.5	15.1	15.3	39.8	24.5	32.1	20.4	28.3	24.4	23.3	31.1	27.3	1.0	0.9	1.0
50 to 59	100.0	100.0	100.0	13.0	4.3	8.7	27.8	23.5	25.7	24.3	31.3	27.8	34.8	38.3	36.5	..	2.6	1.3
60 to 69	100.0	100.0	100.0	8.1	10.0	9.0	15.1	11.4	13.5	41.9	35.7	39.1	34.9	42.9	38.5	..	..	..
70 to 79	100.0	100.0	100.0	2.0	3.0	2.4	22.0	21.2	21.7	34.0	24.2	30.1	42.0	51.5	45.8	..	..	..
80 to 89	100.0	100.0	100.0	9.1	..	6.3	..	20.0	6.3	54.5	60.0	56.3	36.4	20.0	31.3	..	..	..
90 to 99	100.0	100.0	100.0	..	..	..	..	25.0	25.0	..	25.0	25.0	..	50.0	50.0	..	..	..
100 and over	100.0	100.0	100.0	..	16.7	16.7	..	16.7	16.7	..	..	..	..	66.7	66.7	..	..	..
Total	100.0	100.0	100.0	13.5	12.3	12.9	30.1	24.1	27.1	25.3	25.3	25.3	29.7	37.2	33.4	1.3	1.2	1.3

The recovery rate then declined rapidly to a rate of approximately 7 per cent among those receiving over 5,000 units of insulin. When all degrees of improvement are combined, the trend is rather irregular but there is, nevertheless, an indication of a higher rate of improvement among those receiving fewer units of insulin.

Table 9 correlates outcome of insulin treatment with the frequency of comatose states. There is some irregularity in the percentages, but the trend appears to be definite, nevertheless. The rates of recovery and of improvement decreased as the number of comatose states increased.

Table 10 shows the correlation of outcome of treatment with number of convulsions per patient. Up to a frequency of 5 and 6 convulsions, there was a definitely declining trend in the rate of improvement. Beginning with 7 convulsions per patient, the rate of improvement increased, but owing to the relatively small frequencies in the latter intervals, it is not possible to conclude that the change in trend is significant.

We are now in a position to draw definite conclusions from our data as to the effect of hypoglycemic treatment of dementia præcox. There can be no doubt as to the immediate efficacy of the treatment. Insulin shock therapy raised the recovery rate from approximately 4 per cent in untreated cases to 13 per cent in treated cases. It brought about a marked improvement in an additional 27 per cent, compared with only 11 per cent in the untreated group. Combining all degrees of improvement, we found that 65 per cent showed some degree of improvement after treatment with insulin, compared with only 22 per cent in the untreated group. Improvement rates were lowest among the hebephrenics. They were highest in the simple type, though the number of cases in this group was too small to lend significance to the result. Rates of improvement among catatonics and paranoids were significantly higher than those of the hebephrenics. There is a striking correlation between the rate of improvement and the duration of the disease before the beginning of treatment. The earlier in the course of the disase that the patient is submitted to treatment, the better is the prospect of recovery and rehabilitation.

TABLE 8. OUTCOME OF INSULIN TREATMENT ACCORDING TO UNITS OF INSULIN PER PATIENT

Units of insulin used per patient	Total			Recovered			Much improved			Improved			Unimproved			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
								Number										
Less than 1,000	25	39	64	3	9	12	8	11	19	1	5	6	10	14	24	3	..	3
1,000 to 1,999	63	90	153	11	12	23	27	29	56	11	16	27	13	32	45	1	1	2
2,000 to 2,999	70	101	171	17	12	29	30	31	61	11	23	34	11	33	44	1	2	3
3,000 to 3,999	83	94	177	16	15	31	21	20	41	21	23	44	24	35	59	1	1	2
4,000 to 4,999	63	53	116	6	7	13	16	8	24	17	15	32	23	22	45	1	1	2
5,000 to 5,999	48	44	92	6	2	8	17	10	27	8	13	21	17	19	36	..	..	..
6,000 to 6,999	42	36	78	4	1	5	10	7	17	14	18	32	14	10	24	..	..	..
7,000 to 7,999	44	24	68	3	..	3	14	2	16	15	10	25	12	11	23	..	1	1
8,000 to 8,999	25	14	39	2	3	5	2	4	6	11	2	13	10	5	15	..	..	..
9,000 to 9,999	18	11	29	..	1	1	5	2	7	4	3	7	9	5	14	..	..	..
10,000 and over	44	8	52	3	1	4	8	..	8	20	2	22	13	5	18	..	..	..
Total	525	514	1,039	71	63	134	158	124	282	133	130	263	156	191	347	7	6	13
								Per cent										
Less than 1,000	100.0	100.0	100.0	12.0	23.1	18.8	32.0	28.2	29.7	4.0	12.8	9.4	40.0	35.9	37.5	12.0	..	4.7
1,000 to 1,999	100.0	100.0	100.0	17.5	13.3	15.0	42.9	32.2	36.6	17.5	17.8	17.6	20.6	35.6	29.4	1.6	1.1	1.3
2,000 to 2,999	100.0	100.0	100.0	24.3	11.9	17.0	42.9	30.7	35.7	15.7	22.8	19.9	15.7	32.7	25.7	1.4	2.0	1.8
3,000 to 3,999	100.0	100.0	100.0	19.3	16.0	17.5	25.3	21.3	23.2	25.3	24.5	24.9	28.9	37.2	33.3	1.2	1.1	1.1
4,000 to 4,999	100.0	100.0	100.0	9.5	13.2	11.2	25.4	15.1	20.7	27.0	28.3	27.6	36.5	41.5	38.9	1.6	1.9	1.7
5,000 to 5,999	100.0	100.0	100.0	12.5	4.5	8.7	35.4	22.7	29.3	16.7	29.5	22.8	35.4	43.2	39.1	..	..	..
6,000 to 6,999	100.0	100.0	100.0	9.5	2.8	6.4	23.8	19.4	21.8	33.3	50.0	41.0	33.3	27.7	30.8	..	..	..
7,000 to 7,999	100.0	100.0	100.0	6.8	..	4.4	31.8	8.3	23.5	34.1	41.7	36.8	27.3	45.8	33.8	..	4.2	1.5
8,000 to 8,999	100.0	100.0	100.0	8.0	21.4	12.8	8.0	28.6	15.4	44.0	14.3	33.3	40.0	35.7	38.5	..	..	..
9,000 to 9,999	100.0	100.0	100.0	..	9.1	3.4	27.8	18.2	24.1	22.2	27.3	24.1	50.0	45.5	48.3	..	..	..
10,000 and over	100.0	100.0	100.0	6.8	12.5	7.7	18.2	..	15.4	45.5	25.0	42.3	29.5	62.5	34.6	..	..	..
Total	100.0	100.0	100.0	13.5	12.3	12.9	30.1	24.1	27.1	25.3	25.3	25.3	29.7	37.2	33.4	1.3	1.2	1.3

TABLE 9. OUTCOME OF INSULIN TREATMENT ACCORDING TO NUMBER OF COMATOSE STATES PER PATIENT

Number of comatose states	Total			Recovered			Much improved			Improved			Unimproved			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
								Number										
None	14	21	35	1	6	7	5	7	12	2	6	8	6	2	8	..	..	..
1- 9	61	63	124	6	11	17	23	15	38	14	7	21	16	29	45	2	1	3
10-19	78	65	143	11	5	16	27	22	49	16	7	23	22	29	51	2	2	4
20-29	84	67	151	15	14	29	27	13	40	18	24	42	22	16	38	2	..	2
30-39	94	94	188	15	9	24	36	25	61	17	18	35	25	42	67	1	..	1
40-49	94	89	183	16	11	27	23	23	46	22	29	51	33	23	56	..	3	3
50-59	76	70	146	6	3	9	11	11	22	35	23	58	24	33	57	..	..	..
60-69	21	37	58	1	3	4	6	7	13	7	13	20	7	14	21	..	..	..
70 and over	3	8	11	..	1	1	..	1	1	2	3	5	1	3	4	..	..	..
Total	525	514	1,039	71	63	134	158	124	282	133	130	263	156	191	347	7	6	13
								Per cent										
None	100.0	100.0	100.0	7.1	28.6	20.0	35.7	33.3	34.3	14.3	28.6	22.9	42.9	9.5	22.9	..	..	..
1- 9	100.0	100.0	100.0	9.8	17.5	13.7	37.7	23.8	30.6	23.0	11.1	16.9	26.2	46.0	36.3	3.3	1.6	2.4
10-19	100.0	100.0	100.0	14.1	7.7	11.2	34.6	33.8	34.3	20.5	10.8	16.1	28.2	44.6	35.7	2.6	3.1	2.8
20-29	100.0	100.0	100.0	17.9	20.9	19.2	32.1	19.4	26.5	21.4	35.8	27.8	26.2	23.9	25.2	2.4	..	1.3
30-39	100.0	100.0	100.0	16.0	9.6	12.8	38.3	26.6	32.4	18.1	19.1	18.6	26.6	44.7	35.6	1.1	..	0.5
40-49	100.0	100.0	100.0	17.0	12.4	14.8	24.5	25.8	25.1	23.4	32.6	27.9	35.1	25.8	30.6	..	3.4	1.6
50-59	100.0	100.0	100.0	7.9	4.3	6.2	14.5	15.7	15.1	46.1	32.9	39.7	31.6	47.1	39.0	..	..	..
60-69	100.0	100.0	100.0	4.8	8.1	6.9	28.6	18.9	22.4	33.3	35.1	34.5	33.3	37.8	36.2	..	..	..
70 and over	100.0	100.0	100.0	..	12.5	9.1	..	12.5	9.1	66.7	37.5	45.5	33.3	37.5	36.4	..	..	..
Total	100.0	100.0	100.0	13.5	12.3	12.9	30.1	24.1	27.1	25.3	25.3	25.3	29.7	37.2	33.4	1.3	1.2	1.3

TABLE 10. OUTCOME OF INSULIN TREATMENT ACCORDING TO NUMBER OF CONVULSIONS PER PATIENT

Number of convulsions	Total			Recovered			Much improved			Improved			Unimproved			Died		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
								Number										
None	305	340	645	54	49	103	84	87	171	76	84	160	88	114	202	3	6	9
1- 2	113	84	197	14	8	22	37	17	54	25	22	47	34	37	71	3	..	3
3- 4	32	43	75	1	2	3	10	10	20	8	12	20	12	19	31	1	..	1
5- 6	19	14	33	..	2	2	2	2	4	8	3	11	9	7	16	..	..	..
7- 8	16	9	25	..	..	..	7	4	11	3	2	5	6	3	9	..	..	..
9-10	6	4	10	1	1	2	..	..	..	3	1	4	2	2	4	..	..	..
11 and over	34	20	54	1	1	2	18	4	22	10	6	16	5	9	14	..	..	..
Total	525	514	1,039	71	63	134	158	124	282	133	130	263	156	191	347	7	6	13
								Per cent										
None	100.0	100.0	100.0	17.7	14.4	16.0	27.5	25.6	26.5	24.9	24.7	24.8	28.5	33.2	31.0	1.0	1.8	1.4
1- 2	100.0	100.0	100.0	12.4	9.5	11.2	32.7	20.2	27.4	22.1	26.2	23.9	30.1	44.0	36.0	2.7	..	1.5
3- 4	100.0	100.0	100.0	3.1	4.7	4.0	31.3	23.3	26.7	25.0	27.9	26.7	37.5	44.2	41.3	3.1	..	1.3
5- 6	100.0	100.0	100.0	..	14.3	6.1	10.5	14.3	12.1	42.1	21.4	33.3	47.4	50.0	48.5	..	..	..
7- 8	100.0	100.0	100.0	..	..	..	43.8	44.4	44.0	18.8	22.2	20.0	37.5	33.3	36.0	..	..	..
9-10	100.0	100.0	100.0	16.7	25.0	20.0	..	..	..	50.0	25.0	40.0	33.3	50.0	40.0	..	..	..
11 and over	100.0	100.0	100.0	2.9	5.0	3.7	52.9	20.0	40.7	29.4	30.0	29.6	14.7	45.0	25.9	..	..	..
Total	100.0	100.0	100.0	13.5	12.3	12.9	30.1	24.1	27.1	25.3	25.3	25.3	29.7	37.2	33.4	1.3	1.2	1.3

At present it is impossible to state what will be the ultimate effects of insulin treatment of dementia præcox. Do remissions and improvements last? Only with the passage of time can this question be fully answered. But already we know that there are some relapses. (See Table 11.) Thus of the 1,039 patients treated with insulin, 510 were paroled, and of the latter total, 125, or 24.5 per cent, were returned from parole. A certain percentage of relapses is to be expected, however, under any type of therapy. It is therefore essential, in order to complete the picture, that the histories of patients receiving insulin therapy be indicated for perhaps five years after the close of such treatment.

TABLE 11. INSULIN-TREATED PATIENTS PAROLED BY THE SEVERAL STATE HOSPITALS WITH RETURNS FROM PAROLE TO MARCH 1, 1938

State hospitals	Total patients treated			Patients paroled			Returned from parole		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
Binghamton	20	29	49	15	19	34	6	5	11
Brooklyn	88	89	177	58	43	101	6	10	16
Buffalo	41	26	67	32	14	46	7	2	9
Central Islip	39	37	76	24	17	41	6	5	11
Creedmoor	23	15	38	13	10	23	3	3	6
Gowanda	13	19	32	7	14	21	2	4	6
Harlem Valley	48	46	94	31	20	51	11	7	18
Hudson River	44	31	75	10	11	21	4	4	8
Kings Park	18	39	57	9	17	26	2	2	4
Manhattan	18	7	25	2	1	3	1	..	1
Marcy	13	12	25	5	4	9	..	..	..
Middletown	7	11	18	4	3	7	1	1	2
Pilgrim	14	24	38	6	16	22	2	1	3
Psychiatric Institute	28	34	62	20	15	35	7	4	11
Rochester	24	24	48	15	4	19	5	1	6
Rockland	29	18	47	8	5	13	1	1	2
St. Lawrence	17	31	48	6	3	9	2	2	4
Utica	17	16	33	9	4	13	1	1	2
Willard	24	6	30	13	3	16	4	1	5
Total	525	514	1,039	287	223	510	71	54	125

Without waiting for this final test, however, it appears permissible to draw comfort and encouragement from the present results. No longer need families feel the anguish and despair that come from the thought of an incurably stricken relative. It is neces-

sary, however, to reiterate the pressing need of early diagnosis and treatment, and this requires the intelligent cooperation of the public with hospital authorities.

With the growth and extension of insulin therapy, a further gain may be looked forward to. Almost two years ago, I addressed this Conference on the question of trends of mental disease in New York State. I then stated that on the basis of the growth in the population of the civil State hospitals between 1925 and 1935 we might reasonably anticipate a population of 107,000 in 1945.[5] The growth during the past two years has been entirely consistent with this prediction. Now we have at our disposal an entirely new approach. Should time bear out our expectations with respect to the curability of dementia præcox, we will gradually experience a falling off in the number of such patients in our hospitals. No longer will there be the steady accumulation of chronic dementia præcox patients. Instead of an annual increase of 2,000 patients, necessitating ever greater expenditures by the State for the care of its wards, we may, therefore, at long last envisage the possibility of the stabilizing of the population of our State hospitals. To the joy of the mother and father who see their child returned to them we may therefore add the prospect of relief to the harassed taxpayer.

REFERENCES

1. Sakel, M.: The origin and nature of hypoglycemic therapy of the psychoses. Bulletin of the New York Academy of Medicine, 13: 97-109, 1937.
2. Ibid. 107-108.
3. Ross, J. R.: Report of the hypoglycemic treatment in New York State hospitals. Am. Journal of Psychiatry, 94: 131-134, 1937.
4. Statistical Guide: Eleventh edition. State Hospitals Press, Utica, N. Y., 1934, 62.
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Kings Park	18	39	57	9	17	26	2	2	4
Manhattan	18	7	25	2	1	3	1	..	1
Marcy	13	12	25	5	4	9	..	..	..
Middletown	7	11	18	4	3	7	1	1	2
Pilgrim	14	24	38	6	16	22	2	1	3
Psychiatric Institute	28	34	62	20	15	35	7	4	11
Rochester	24	24	48	15	4	19	5	1	6
Rockland	29	18	47	8	5	13	1	1	2
St. Lawrence	17	31	48	6	3	9	2	2	4
Utica	17	16	33	9	4	13	1	1	2
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3. Ross, J. R.: Report of the hypoglycemic treatment in New York State hospitals. Am. Journal of Psychiatry, 94: 131-134, 1937.
4. Statistical Guide: Eleventh edition. State Hospitals Press, Utica, N. Y., 1934, 62.
5. Malzberg, B.: Trends of mental disease in New York State. PSYCHIATRIC QUARTERLY, 10, 672, 1936.

STATUS OF PAROLED PATIENTS TREATED WITH HYPOGLYCEMIC SHOCK*

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Since insulin therapy was begun at the Pilgrim State Hospital, 26 patients (19 female, 7 male) so treated, have been paroled or discharged. Among these patients are two diagnosed manic-depressive who are included in the present discussion by reason of the schizophrenic features of their cases. Among the remaining patients, all schizophrenic, were 14 paranoids, 4 catatonics, 1 hebephrenic and 5 of the simple type.

The duration of the psychosis prior to treatment was more than 18 months in 11 patients, and of a shorter period in the remaining 15 patients.

The age range was from 18 to 43 years. There were five patients between 18 and 20 years, the succeeding five-year groups claiming 6, 7, 4, 3 and 1 respectively. As might be expected, more chronic mental illness had been present for a shorter period in the younger age groups. Only three of the 15 more acute cases were over 27 years of age and only three of the more chronic cases were under 28 years.

The more chronic cases included four paranoids, one catatonic, one hebephrenic and two of the simple type. Only two of the 26 cases were considered (apart from use of insulin therapy) to have a fair prognosis, the others being rated as guarded or poor.

Brief accounts of the above 26 cases are presented here for consideration:

Illustrative Cases

H. N.: Male, 24 years, single. He has a Bachelor of Arts degree and was last employed as a textile buyer. He is described as being sociable with many friends. The duration of his illness before treatment was five months. Diagnosis: dementia præcox, paranoid.

Since graduation from college in 1935, the patient has shown unstable, impulsive behavior. On his way home from South Africa after his mother's death he stopped off in South America for a few

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weeks, drank heavily and became infected with syphilis. In March, 1937, he began to believe that his fellow employees were cheating the company and that he was acting as a detective in the case, and behaved irrationally as a result.

The patient was admitted to Pilgrim State Hospital, May 18, 1937, in good physical condition, though his blood Wassermann was positive. He was, at times, impulsively assaultive, had visual and auditory hallucinations and the same ideas of "graft" as mentioned above. His affect was inappropriate, judgment impaired and insight lacking. The prognosis was considered poor.

Hypoglycemic shock therapy was given from August 16 to October 8, 1937, a period of 53 days. He received 3,955 units of insulin and there were 26 coma doses and 124 hours of hypoglycemia. The first sign of improvement was the clearing of his delusions and hallucinations; later his affective responses became more normal and he developed considerable insight; he was considered much improved. On October 30, 1937, he was paroled and his improvement has continued, despite unemployment.

E. T.: Female, 24 years, single. She had a high school education and was later employed as a waitress. She is described as seclusive, studious, with few friends. The duration of her illness prior to treatment was four months. Diagnosis: dementia præcox, paranoid.

She became restless, laughed without apparent excuse, talked to herself, was preoccupied. She later became disturbed, irritable and began to talk incoherently.

The patient was admitted to Pilgrim State Hospital, August 11, 1937, in good physical condition. She was negativistic, resistive, mute, at times assaultive and overactive. For three months she did not improve mentally and her prognosis was considered guarded.

Hypoglycemic shock therapy was given for 29 days, from December 9, 1937, to January 7, 1938. She received 1,595 units of insulin and there were 17 comas and 83 hours of hypoglycemia. The patient showed early improvement and on completion of her treatment she was free of any obvious psychotic symptoms, although insight was not complete. She was considered much improved and

was paroled January 15, 1938. Since then she has adjusted well and appears to have regained her prepsychotic level, having resumed all of her usual activities and interests.

F. W.: Female, 30 years, separated. She had two years of high school education; was later a typist. She is described as irritable, sarcastic and unstable. The duration of her illness before treatment was 21 months. Diagnosis: dementia præcox, paranoid.

The patient's first mental symptoms developed after the termination (by separation) of an unhappy marriage, in 1935. She began to attend many "wild" parties and was sexually promiscuous. During September, 1935, she was depressed and had ideas of persecution and influence. She again became upset after returning to work in April, 1936, with similar delusions.

First admission: New York State Psychiatric Institute and Hospital; hospital residence was from June 10 to August 25, 1936. She was diagnosed dementia præcox, paranoid, and left the hospital against advice. After improving slightly for a few months she suddenly became quite depressed, attempted suicide by poison and later had auditory hallucinations.

She was readmitted, to Pilgrim State Hospital, March 29, 1937, in good physical condition, with the mental symptoms cited above. For two months she failed to improve and her prognosis seemed poor.

The patient was under hypoglycemic shock treatment for 96 days, from June 6 to September 10, 1937. She received 5,970 units of insulin; there were 62 comas and 345 hours of hypoglycemia. She showed definite mental improvement, although there were some residuals in the affective sphere. Delusions and hallucinations were submerged and she had partial insight. She was considered improved and was paroled September 17, 1937. Since then the patient has continued to improve, is now active with fairly broad interests, despite her unemployment.

A. W.: Female, 31 years, single. She completed high school and later worked as a stenographer. She is described as difficult to get along with, seclusive and depressive. The duration of her illness prior to treatment was two years. Diagnosis: dementia præcox, catatonic.

The patient had an acute mental upset of about three weeks duration in 1935, with delusions of reference and persecution, some depression and confusion and later overactivity. Although idle, she seemed to be well for the following year. She then worked for about six months at several jobs but was dissatisfied with all of them. Shortly before her admission she became confused and was found wandering about aimlessly.

The patient was admitted to Pilgrim State Hospital, April 12, 1937, in good physical condition. Mentally she was restless and inattentive; her conversation was disconnected; she had auditory and visual hallucinations; her sensorium was unclear and she had no insight. Her prognosis seemed guarded.

Hypoglycemic shock therapy was administered for 26 days, from May 2 to 28, 1937. She received 1,280 units of insulin; had 20 comas and 96 hours of hypoglycemia. Improvement became evident after the fourth dose of insulin. On completion of treatment she had made an excellent improvement, had partial insight, although she claimed amnesia for the details of her acute mental upset. The patient was considered much improved and was paroled on June 13, 1937. Since then, she has maintained her improved state, obtained a job, but shows some uncertainty in her manner.

A. C.: Female, 26 years, single. She had one year high school education and later worked as a seamstress on lampshades. She is described as shy, seclusive, with few friends and a tendency to become self-absorbed. The duration of her illness prior to treatment was 10 months. Diagnosis: dementia præcox, paranoid.

The patient stopped work in 1936 because she felt "nervous" and later developed delusions of reference and persecution, accompanied by visual hallucinations with a religious coloring.

She was admitted to Pilgrim State Hospital, June 7, 1937, at which time she was reserved and irritable. She admitted visual and auditory hallucinations, thought she was pregnant by her lovers (phantasied) but acknowledged mental illness. Her prognosis seemed poor. Her physical condition was good.

Insulin treatment was given for 94 days, from June 28 to September 30, 1937. She received 4,710 units of insulin; had 64 comas,

during three of which she had generalized convulsions, and 345 hours of hypoglycemia. After treatment was completed she seemed very little better, except that she was more pleasant and cooperative. However, within three weeks her delusions and hallucinations had disappeared and she showed more insight, although she had some residual affective defects. She was considered much improved and was paroled November 12, 1937. Since then she has adjusted well at home but is still unemployed.

R. C.: Female, 36 years, single. She had a grammar school education followed by two years at business school and later worked as a stenographer. She is said to have been lively, affectionate and a good mixer. The duration of her mental symptoms prior to treatment was one year. Diagnosis: dementia præcox, paranoid.

The patient gradually became seclusive, depressed and suspicious of her fiance, who, she thought, was married. A year later she became depressed, slashed her wrist and chest. She was restless, evasive, expressed delusions of influence and persecution, and had impaired insight and judgment.

The patient was admitted to Pilgrim State Hospital, November 1, 1937, with mental symptoms described above. Physical examination was essentially negative. Her prognosis was considered unfavorable.

Insulin therapy was given for 44 days, from November 30, 1937, to January 29, 1938. She received 1,579 units of insulin; had 40 comas, with a generalized convulsion during one, and 177 hours of hypoglycemia. Her improvement was rapid; she became more sociable, with increasingly normal interests, her delusions disappear and she developed some insight. She was considered much improved and on February 13, 1938, was paroled. Improvement since has been well maintained, although she is not yet employed.

M. O'C.: Female, 27 years, married (in 1931). Has a six-year-old son. She had a high school education, worked as a secretary before marriage. She is described as a sociable, cheerful and kindly person. The duration of her illness before treatment was six months. Diagnosis: manic-depressive psychosis, mixed (schizoid features).

The patient was restless and worried for three months and suddenly became elated, overactive, expressed grandiose delusions, with visual and auditory hallucinations.

She was admitted to Pilgrim State Hospital, April 14, 1937, at which time her physical examination was essentially negative. The patient at first was free of her original symptoms but after three weeks she became disturbed, confused, resistive, had ideas of persecution. Later she became disinterested and less active. Her prognosis was considered guarded.

Shock therapy was given from July 19, to August 3, 1937, a period of 15 days. She received 555 units of insulin; had seven comas, two generalized convulsions and 50 hours of hypoglycemia. By the fourth day of treatment improvement began. Her psychotic content gradually cleared; she became pleasant and cooperative, with adequate, appropriate affect and partial insight. The patient was considered much improved and was paroled August 8, 1937. Since then she has done only fairly well, and is now rather seclusive and apathetic, being rated only improved.

S. F.: Female, 20 years, single. She had a high school education and later worked as a stenographer. She has always been shy and retiring with no friends, fastidious but ambitious and even-tempered. The duration of her psychosis prior to treatment was two years. Diagnosis: dementia præcox, hebephrenic.

The patient has been mentally ill since she stopped school at 18 years, at first with insomnia, loss of weight and an increased tendency to worry. Later she developed delusions of persecution, silly mannerisms and grimaces, and her conversation was often irrelevant and incoherent.

The patient was admitted to Pilgrim State Hospital, May 14, 1937, with the above symptoms, but later became mute and idle. Her physical condition was good and the prognosis considered poor.

Shock therapy was administered for 37 days, June 15 to July 22, 1937. She received 2,625 units of insulin, had 22 comas and 135 hours of hypoglycemia. During treatment she had four generalized convulsions and showed a peculiar striatal reaction with fever. She improved rapidly in the latter 10 days of treatment, became more interested, friendly, pleasant, denied delusions and trends

but had no insight. She was considered improved and was paroled August 1, 1937. Since then she has improved further, is said to have even wider interests than before her illness and is now considered much improved.

G. B.: Female, 22 years, single. She had three years of college education. She is said to have been well liked by both sexes and to have had wide interests. The duration of her illness prior to treatment was three and one-half years. Diagnosis: dementia præcox, catatonic.

In May, 1934, the patient had a 10-day period of excitement. Again in February, 1935, she became mentally upset.

First admission: New York State Psychiatric Institute and Hospital; hospital residence was from February 27 to June 25, 1935. She was very disturbed and showed much dissociation between content and affect, was diagnosed dementia præcox, hebephrenic and was discharged as unimproved.

Second admission: Dr. Barnes' Sanitarium; residence was from June 26 to August 16, 1935. During this time she showed steady mental improvement and was discharged as recovered with the same diagnosis as above. She adjusted fairly well until April, 1937, when she had a return of mental symptoms.

Third admission: Dr. Barnes' Sanitarium; residence from April 8 to June 17, 1937. The patient showed regressive symptoms and was subject to auditory hallucinations. The same diagnosis was made and she was discharged as improved. After a few weeks she had to be rehospitalized.

Fourth admission: Pilgrim State Hospital, July 16, 1937. On admission she was in good physical condition; mentally she was restless, with erotic behavior, expressed ideas of reference, admitted auditory and visual hallucinations. Later she became mute and exhibited cerea flexibilitas. Her prognosis was considered poor.

Shock therapy was given for 65 days from October 13 to December 17, 1937. She received 8,145 units of insulin; had 30 comas and 207 hours of hypoglycemia. The patient began to improve at the fifth day of treatment and by the thirty-seventh showed good integration, although there were some residual emotional defects

and only partial insight. She was considered much improved and was paroled December 31, 1937. Since then she has improved further, is now working and has renewed her usual interests.

E. H.: Male, 27 years, married. He has a Bachelor of Arts degree and has been working as a stock clerk. He is described as having no striking traits but was reserved, with few close friends, and was dependent on his parents. The duration of his illness prior to treatment was 16 months. Diagnosis: dementia præcox, simple.

The patient made a successful adjustment until 1933, when he married, but only a fair adjustment thereafter, until about July, 1936. He was always very jealous of his wife and changeable in his affection towards her. He developed ideas of infidelity on the part of his wife, was sleepless, began to have difficulty with his fellow workers and finally talked irrationally.

The patient was admitted to Pilgrim State Hospital, August 16, 1937, in good physical condition. He was dull, indifferent, evasive and expressed a trend against his wife. His prognosis was considered poor and he showed no signs of improvement over a period of four months.

Shock therapy was given for 18 days from December 9 to 27, 1937. He received 1,340 units of insulin; had two comas and 49½ hours of hypoglycemia. Rapid improvement took place and by the thirteenth day of treatment, after having had two comas, he appeared to have regained his prepsychotic level and was considered much improved. He was paroled January 9, 1938, and since that time he has remained about the same mentally, being somewhat seclusive, inactive, living with his parents and showing little interest in his wife and children.

T. D.: Female, 20 years, single. She had one year of high school education and later worked as a waitress. She was always shy and reticent; had difficulty in making friends and showed little interest in the opposite sex. The duration of her illness prior to treatment was three and one-half months. Diagnosis: dementia præcox, simple.

The patient witnessed a murder in 1935, testified at the trial in April, 1936, and became somewhat apprehensive. In December,

1936, she became panicky, when she saw one of the accused, who had been acquitted, and thought he was after her. She began to believe that there was poison in her food and was suspicious and apprehensive.

She was admitted to Pilgrim State Hospital, February 3, 1937, at which time she was in good physical condition. Mentally she was reticent, evasive, appeared unhappy, hopeless and confused, was subject to auditory hallucinations and showed lack of insight. The prognosis in her case seemed very doubtful.

Shock therapy was given for 45 days, from April 12 to May 27, 1937. She received 1,280 units of insulin; had 13 comas and 108 hours of hypoglycemia. The patient soon began to improve, became brighter, more interested; hallucinations and delusions cleared, and she exhibited good affective response and considerable insight. She was thought to be much improved and was paroled June 6, 1937. Since, she has adjusted well and seems to be at her prepsychotic level.

D. E.: Female, 27 years, married (in 1931), has a two-year-old child. She had three years of high school education. Before marriage she was a store clerk. She is said to have been open, sociable, fond of amusement, but was self-conscious and oversensitive, with no absorbing interests. The duration of her mental illness prior to treatment was four months. Diagnosis: dementia præcox, paranoid.

The patient's first symptoms, headaches, fatigue and insomnia, developed August 13, 1937. Later she became depressed and feared that she and her family would be harmed.

The patient was admitted to Louden-Knickerbocker Hall, August 19, 1937. En route to the hospital she attempted suicide and while there expressed a trend against her husband, delusions of persecution and self-accusatory ideas. She was transferred to Pilgrim State Hospital, November 19, 1937, in good physical condition, but mentally unimproved. Her prognosis was considered guarded.

Hypoglycemic shock therapy was given from December 15, 1937, to January 21, 1938, a period of 37 days. She received 1,670 units of insulin; had 20 comas, of which one was prolonged, and 84 hours

of hypoglycemia. There was improvement during treatment and she became more agreeable, cooperative, free of delusions, with good affective response except for some silly playfulness at times. She was considered improved mentally and was discharged February 5, 1938. Since, she has shown a very natural manner and has resumed all her former activities.

A. Kol.: Female, 19 years, single. She had one year of college education and worked as a typist. She is said to have been very seclusive and self-centered. The duration of her illness prior to treatment was 14 months. Diagnosis: dementia præcox, paranoid.

For a year the patient expressed ideas of reference and persecution with sexual coloring and was subject to auditory hallucinations.

She was admitted to Pilgrim State Hospital, February 5, 1937, in satisfactory physical condition. Mental examination revealed the above symptoms and her prognosis seemed poor.

Treatment with insulin was given from March 13 to June 4, 1937, a period of 83 days. She received 9,755 units of insulin; had 60 comas and 270 hours of hypoglycemia. She improved physically but showed no mental change during treatment. Later there was a submergence of delusions and hallucinations, although she continued to be dull emotionally. Still later she became more alert and sociable but showed some uncertainty. The patient was paroled September 12, 1937, as improved. Since that time she has maintained the same state; at times she is preoccupied, she is slow in doing housework and is not as yet sociable with her old friends.

R. A.: Female, 28 years, married (in 1934). Had two years of high school education, was formerly stenographer and secretary. Described as being reserved, suspicious, worrisome, a daydreamer. Duration of her illness prior to treatment was three years. Diagnosis: dementia præcox, paranoid.

The patient had two unsatisfactory love affairs before marrying "on the rebound." Marital adjustment was poor. Gradually she developed ideas of reference and persecution and later auditory hallucinations.

First admission: Long Island Home; residence there was from February 2 to March 4, 1936. She was diagnosed dementia præcox and was discharged as improved.

Second admission: New York Hospital, Westchester Division; hospital residence was from March 14, 1936 to November 27, 1937. On the latter date the patient was transferred to Pilgrim State Hospital in good physical condition but mentally she was evasive, aloof and uncommunicative and her prognosis was considered poor.

Hypoglycemic shock therapy was administered from June 24 to October 15, 1937, a period of 81 days. She received 6,720 units of insulin; there were 75 comas, two of them prolonged, and 338 hours of hypoglycemia. The patient's improvement was slow. Although she became more cooperative and on pressure admitted mental illness she was still evasive and reserved. She was, however, considered improved. She was paroled October 30, 1937, but did not adjust with her husband and went to live with her parents on January 2, 1938. This patient is now quiet, helps some at home but has few interests and is rather seclusive. She seems to be improving slowly.

H. S.: Female, 18 years, single. She had a grammar school education and later worked as a domestic. She is described as shy, seclusive, with few, if any, friends. The duration of her illness prior to treatment was one month. Diagnosis: dementia præcox, paranoid.

She developed worries over masturbation, became confused and expressed ideas of persecution.

The patient was admitted to Pilgrim State Hospital, November 27, 1937. Physical examination was essentially negative, except for chronic cervicitis. She had the mental symptoms described above and also admitted feeling electricity throughout her body and having auditory hallucinations. She lacked insight but the prognosis was considered fair.

Treatment with insulin was administered for 50 days, from December 9, 1937 to January 28, 1938. She received 2,380 units of insulin; had 19 comas and 109 hours of hypoglycemia. She showed improvement during treatment and finally became neat, clean,

more sociable and active, with no preoccupation with sexual matters. The patient had partial insight, was considered improved and was paroled March 5, 1938. She has adjusted satisfactorily and maintained her improvement up to the present time.

D. B.: Female, 32 years, single. She completed one year of college education and later was a stenographer. She is described as suspicious, egotistical, irritable, with few friends. The duration of her illness prior to treatment was seven years. Diagnosis: dementia præcox, paranoid.

Her mental illness dates from 1930, when she became disinterested, anatagonistic to her parents, and at times excited and she threatened suicide.

First admission: (voluntary) New York State Psychiatric Institute and Hospital; residence was from October 2, 1930 to February 8, 1931. She expressed ideas of reference and influence, was diagnosed dementia præcox, paranoid, discharged as unimproved and her prognosis was considered poor.

Second admission: (voluntary) Manhattan State Hospital, April 20 to May 20, 1931. Mentally she showed no essential change from the above condition, was given the same diagnosis and prognosis. For a year she complained that she was too weak to work and had ideas of influence.

Third admission: (voluntary) Rockland State Hospital, October 21, 1932 to March 17, 1933. The patient was confused, feared suicide ,had ideas of influence and thoughts of killing her parents and lover. She was diagnosed dementia præcox, paranoid, and considered improved at the time of her discharge. For the next four years she worked as a stenographer but had great difficulty adjusting with people and thought she was influenced adversely by everything and everybody. She heard of insulin treatment for dementia præcox and decided to avail herself thereof.

Fourth admission: (voluntary) Harlem Valley State Hospital, where residence was from February 6 to April 7, 1937, and she was diagnosed dementia præcox, paranoid. After nine injections of insulin and one coma she left, because of a change of physicians, in an unimproved state. During the interval she felt insecure and worried about her mental condition.

Fifth admission: (voluntary) Pilgrim State Hospital, July 24, 1937. Physically she was found to be in good health. She expressed the ideas of influence described above, although her affect seemed reasonably appropriate and adequate. She did, however, show some increased tension in discussing her family situation. Her prognosis was considered doubtful.

Shock therapy was given for 81 days, from August 9 to October 29, 1937. She received 7,710 units of insulin; there were 52 comas, one of which was prolonged, and 297 hours of hypoglycemia. Following treatment, she appeared in excellent mental condition, had good affective response, was able to converse well and she showed considerable insight. The patient claimed that she felt better than she had for years and she was considered improved when discharged, November 8, 1937. She has maintained her improved status since then and has been self-supporting.

A. K.: Female, 19 years, single. She completed grammar school education. She is described as a shy, seclusive, worrisome individual. The duration of her illness before treatment was one year. Diagnosis: dementia præcox, simple.

There was a gradual loss of interest on the part of the patient except in her personal appearance. She was unable to hold any of the jobs she obtained.

She was admitted to Pilgrim State Hospital, March 28, 1937, in good physical condition. She expressed vague ideas of reference and influence and was quite dull and indifferent. Patient's prognosis was considered quite unfavorable.

Hypoglycemic shock treatment was given from April 9 to June 26, 1937, a period of 78 days. She received 6,300 units of insulin; had 50 comas and 235 hours of hypoglycemia. Little, if any, change was noted during treatment, but later her delusions disappeared and she showed more interest. The patient was paroled, October 4, 1937, as improved. There has been further improvement since and although she has shown sufficient initiative to look for work she is still somewhat diffident and uncertain.

H. L.: Male, 23 years, single. He had three years high school education, later working as a stock clerk. He is said to have been

seclusive and self-centered. The duration of his illness before treatment was seven months. Diagnosis: dementia præcox, simple.

In March, 1937, he developed complaints referrable to his throat, talked irrelevantly and later expressed ideas of reference and persecution.

The patient was admitted to Pilgrim State Hospital, May 7, 1937, at which time he was in good physical condition. He admitted the ideas mentioned above, was shallow emotionally, disinterested, and had no insight. The prognosis in his case was considered doubtful.

Hypoglycemic shock therapy was given for 81 days, from October 18, 1937 to January 7, 1938. He received 7,155 units of insulin; had 49 comas and 223 hours of hypoglycemia. He gradually improved so that he no longer expressed delusions and hallucinations and became more interested in his environment, although there was considerable apathy still present. The patient was considered improved and was paroled January 23, 1938. Since that time there has been further increase in interest but he is still quite superficial in his emotional response.

M. M.: Female, 29 years, married (in 1930). She had two years high school education and afterwards worked as an insurance clerk. Her makeup is described as depressive and unstable. The duration of her illness before treatment was three years. Diagnosis: dementia præcox, paranoid.

Because of the patient's fear of pregnancy, marital relations were unsatisfactory. In 1934 she was depressed for a short period of time. During the next year she lost her job, gradually became depressed, idle, seclusive and at times very stubborn.

The patient was admitted to Pilgrim State Hospital May 19, 1937, with insignificant physical findings. Mentally she was evasive, suspicious, made peculiar noises, grimaced and appeared to react to hallucinations. She expressed vague ideas of influence and had no insight into her condition. The prognosis in her case was considered poor.

Shock treatment was given for 94 days, from June 28 to September 30, 1937. She received 6,160 units of insulin; had 62 comas and 335 hours of hypoglycemia. During treatment she

showed improvement in her behavior and affective responses with gradual submergence of delusions, however, she still lacked insight. The patient was paroled October 24, 1937, in an improved condition. There has been no further improvement since she left the hospital.

L. P.: Male, 32 years, single. He had three and one-half years of college education, later was in the army and had spent about a year as a cadet at West Point. He is described as having had no striking traits. The duration of his illness before treatment was about eight years. Diagnosis: dementia præcox, simple.

In 1926, while at West Point, he developed somatic complaints and was given leave of absence for eight months. He again expressed somatic complaints, apparently on a neurotic basis, finally became upset, struck an officer and stabbed himself. He was permitted to resign and following this he had odd menial jobs only. In 1931, thinking that he was not normal he sought psychiatric treatment and appeared to benefit therefrom. However, he again sought help in 1933 and at this time expressed resentment against the psychiatrist who had formerly treated him, developed a feeling of insecurity and showed shallow emotional response. He admitted homosexual practices and ideas of reference and influence.

Patient was admitted to Pilgrim State Hospital, November 18, 1935, in good physical condition. He was cooperative, but expressed himself vaguely, was indifferent with few signs of initiative and the prognosis was considered poor. For the next 19 months in the hospital there was little change noted in his condition.

Hypoglycemic shock therapy was given from June 24 to November 11, 1937, a period of 130 days. He received 6,965 units of insulin; had 78 comas and 396 hours of hypoglycemia. Except that he became somewhat more alert and interested, no other improvement was apparent. He was discharged January 22, 1938, as improved and since that time has shown no further change.

C. S.: Female, 43 years, single. She had a common school education and afterwards worked as a machine operator in a factory. She is described as having been seclusive, with a narrow range of interests. The duration of her illness before treatment was three months. Diagnosis: dementia præcox, catatonic.

The patient at first became depressed and restless, later developed ideas of persecution and influence.

She was admitted to Pilgrim State Hospital, October 14, 1937, at which time she was in satisfactory physical condition except for being somewhat undernourished. Mentally, she was mildly depressed but denied delusions. Later she became assaultive, expressed the delusions mentioned above and exhibited catatonic-like symptoms. Her prognosis was considered guarded.

Insulin treatment was administered from December 1, 1937 to January 4, 1938, a period of 35 days. She received 1,465 units of insulin; had 22 comas and 112 hours of hypoglycemia. Improvement became apparent by the fifteenth day of treatment, she finally seemed free of delusions, her affective response was normal and she was well behaved although she had only partial insight. The patient was considered improved at the time of her parole, February 13, 1938. Since that time she has adjusted well at home, is said to be fairly sociable and has been looking for work.

M. J.: Male, 36 years, married. He completed only five grades of grammar school and his recent occupation was that of shoe salesman. He is said to have had no striking traits except that he was worrisome. The duration of his illness before treatment was 18 months. Diagnosis: manic-depressive psychosis, depressive type (schizoid features).

At the time of his mother's death, in 1925, he had a mild depression of short duration. Early in 1936 he became depressed, left his work and complained of not feeling well.

First admission: Hastings Hillside Hospital; residence was from February 27 until September 29, 1936. He was diagnosed manic-depressive psychosis and he was discharged as improved. He soon became depressed, developed somatic complaints and attempted suicide by hanging.

Second admission: Pilgrim State Hospital, June 23, 1937. He was in good physical condition at this time but mentally was depressed and anxious, especially regarding his own symptoms but less so about his wife and child. The prognosis in his case was considered fair.

Shock therapy was given for 84 days, from August 16 to November 8, 1937. The patient received 6,850 units of insulin; had 52 comas and 290 hours of hypoglycemia. On completion of treatment he was still somewhat dull and seemed depressed, although he denied the latter. Two months later he was free of any depressive symptoms. He was paroled January 22, 1938 in an improved mental condition. Since then he has continued about the same mentally, has adjusted well at home and has been looking for work.

S. G.: Female, 33 years, divorced. She had a high school education and was later employed as a secretary. Her makeup is described as seclusive, irritable, stubborn and suspicious, with few lasting friendships. The duration of her illness before treatment was two years. Diagnosis: dementia præcox, catatonic.

She married in 1932 at the age of 28 but obtained a divorce in 1934, being dissatisfied with her husband over business matters. She quarreled with her employers and later developed ideas of reference and persecution.

Patient was admitted to Pilgrim State Hospital, June 19, 1937, in an undernourished but otherwise satisfactory physical condition. In the hospital her paranoid trend continued and at times she showed impulsive behavior and negativism. The prognosis was considered distinctly guarded.

Insulin therapy was given October 14, 1937 to January 7, 1938, a period of 85 days. The patient received 7,095 units of insulin. There were 47 comas and 236 hours of hypoglycemia. During treatment she had three generalized convulsions, one circulatory collapse and some respiratory difficulty. She complained of the treatment but gradually her delusions disappeared and her attitude and behavior became excellent despite residuals in the affective field. She was considered improved and was paroled on January 23, 1938. She has adjusted well at home, but has shown a tendency to talk about her troubles and has not been very sociable.

N. Sal.: Male, 22 years, single. He completed one year of high school, later worked as a radio repair man. He is described as pleasant, agreeable and sociable. The duration of his illness be-

fore treatment was six months. Diagnosis: dementia præcox, paranoid.

Shortly before admission to the hospital, while intoxicated he was badly beaten. After this, he frequently vomited his meals, became fearful, restless, suspicious and overreligious.

On admission to Pilgrim State Hospital, December 23, 1936, he was in satisfactory physical condition. Mentally he was quiet and compliant but somewhat perplexed and hesitant. He admitted worrying that he would be killed, thought that he was sinful, and was subject to auditory hallucinations. His insight was meager and the prognosis considered doubtful. Over a period of six months he showed no mental improvement.

Shock therapy was given for 53 days from June 30 to August 22, 1937. The patient received 3,100 units of insulin; had 37 comas and 202 hours of hypoglycemia. He had one prolonged coma,, after which he showed odd but transient neurological signs. On completion of treatment he was quite alert and interested, recalled his psychotic ideas and had better insight. He was paroled September 26, 1937 as improved. He adjusted well for only a very short time, then became irritable, restless at night, mumbled to himself, was entirely idle and preoccupied. He was returned to the hospital, December 14, 1937, and at present his mental status is unimproved.

N. S.: Male, 21 years, single. He completed seventh grade in public school and later worked as an errand boy. He is described as seclusive, depressive and irritable. The duration of his illness before treatment was eight years. Diagnosis: dementia præcox, paranoid.

In 1929, at the age of 13 years, he showed some schizoid symptoms and presented well-marked homoerotic trends. In 1933, when 17 years of age, he expressed rather grandiose ideas. In 1936, while in the army, he developed delusions of reference, became quite agitated, talked about suicide and thought that he was "insane."

The patient was admitted to Pilgrim State Hospital, January 25, 1937, in good physical condition. He was tense, tearful, his production was disconnected and incoherent at times, he showed

peculiar mannerisms, expressed bizarre somatic complaints and had auditory hallucinations. He exhibited lack of insight and his prognosis was rated poor.

Insulin treatment was given from April 1 to June 23, 1937, a period of 83 days. The patient received 8,670 units of insulin; had 57 comas and 301 hours of hypoglycemia. During the course of treatment he had five severe convulsions. Following treatment he expressed none of his former psychotic ideas, showed improvement in behavior and affective response but was still lacking in insight. On July 11, 1937, he was paroled improved but he failed to make a satisfactory adjustment at home. He became restless, lost interest, was difficult to manage and on August 13, 1937, he was returned to the hospital. At the present time he is unimproved.

F. A.: Female, 36 years, separated. This patient completed common school and four years of art school. She is described as pleasant, active socially, although somewhat egotistical. Her illness had existed two years before treatment. Diagnosis: dementia præcox, paranoid.

Her married life was unhappy, her husband being an alcoholic with an odd personality. Early in 1935 she became irritable, destructive, expressed trends against her mother and husband, later developed auditory hallucinations and refused to eat. She separated from her husband in June, 1935.

First admission: Payne-Whitney Psychiatric Clinic, November 12, 1935. While there she was overactive, overtalkative, expressed delusions of persecution, admitted hallucinations, was at times assaultive and required tube feeding. She was diagnosed dementia præcox, paranoid, and discharged March 16, 1936, as unimproved.

Second admission: St. Vincent's Retreat, March 16, 1936. During this residence she gradually improved and was paroled August 25, 1936, with the above diagnosis. She failed to adjust satisfactorily at home.

Third admission: Pilgrim State Hospital, October 12, 1936. On admission she was in good physical condition but mentally showed rapid changes in mood, expressed persecutory and grandiose delu-

sions, and was fairly cooperative but withdrawn. The prognosis in her case was considered poor.

Shock therapy was given from March 28 to June 24, 1937, a period of 88 days. The patient received 9,815 units of insulin; had 59 comas and 329 hours of hypoglycemia. In the course of treatment she had much respiratory difficulty when in coma, and one generalized convulsion. There was gradual mental improvement. She was more pleasant and cooperative but continued somewhat indifferent, occasionally had auditory hallucinations and lacked insight. She was paroled July 7, 1937, as improved. At home she adjusted poorly, would not leave the house, became difficult to manage and was returned to the hospital, October 2, 1937. She is unimproved at the present time.

Summary

The number of days of treatment given in the above group of patients varied from 11 to 88. Twenty of the 26 patients were treated for a period ranging from 25 to 75 days. The total number of units of insulin given ranged from 555 to 9,815; 14 patients received 5,000 units or less and 12 patients more than 5,000 units. The number of comas varied from 2 to 78, 16 patients having fewer than 50 comas and 10 patients more than 50. The hours of hypoglycemia varied from 49½ to 396, with 12 patients having less than 200 hours and 14 more than that. These figures clearly point to the individual variations in the response to insulin. Convulsions occurred in 11 patients, 6 being the maximum number for one patient. The length of hospitalization, after treatment was begun, varied from 20 to 212 days, 14 patients having a residence of less than 120 days and 12 a longer residence. There were 4 instances of delayed improvement in this group of 26 patients.

After completion of treatment there were 9 patients considered much improved, being without obvious mental symptoms, except for slight residuals in the affective field and only superficial insight. Later they resumed their usual activities. Sixteen patients were improved, showing more obvious mental symptoms than the others, but were very well behaved. One patient seemed unimproved who later showed improvement.

Among the much improved cases were 4 paranoid schizophrenics, 2 catatonics, 2 simple and 1 manic-depressive, mixed type. The unimproved case was a paranoid schizophrenic. In this group of patients the results obtained with the paranoid group were not strikingly better than with the others.

Six of the 9 patients considered much improved had been mentally ill less than 18 months. However, 2 of the 8 cases ill less than 18 months, were in the improved group.

There is an apparent relationship between the rapidity of response to treatment and the results obtained. Only 2 of the 9 much improved patients were under treatment more than 75 days and 4 of them were treated less than 50 days. It also appears, generally speaking, that the patients who responded most favorably received less insulin and had fewer comas and hours of hypoglycemia than the others. Six of the 9 patients receiving the least insulin and having the fewest comas were among the much improved group. There were also 4 of the 5 patients under hypoglycemia for the shortest length of time in the much improved group. However, 2 of those much improved received larger amounts of insulin, had more comas and hours of hypoglycemia than the average. The much improved patient who received the least amount of insulin, and next to the least amount of comas and hypoglycemia, is now rated only as improved. Five of the 11 patients who had convulsions were among those who showed marked improvement, which fact does not clearly indicate either beneficial or harmful effect from the convulsions. Five of the 7 cases in hospital the shortest period after the beginning of treatment, were in the much improved group.

At the present time there have been some changes in the status of the group. Three of the 26 patients under discussion have been returned to the hospital. They were at home one, two and one-half and three months, respectively, and whereas they were formerly rated improved they are now unimproved. One of the much improved patients, diagnosed manic-depressive psychosis, mixed, is now listed only as improved. Two of the formerly improved group, one of the paranoid type and one of the hebephrenic type, are now listed as much improved. The one original unimproved

case is now improved. Thus, there are now 10 patients much improved, 13 improved and 3 unimproved.

As might be expected, the patients whose original endowment was better, form the greater number of the much improved group. The average age of the much improved patients is 25 as compared with 28½ for the improved. The general intellectual level was probably higher in the former group, as indicated by the extent of their formal education. The personality makeup generally, is also better in the much improved patients.

In this series of 26 patients, the time since leaving the hospital varies from 5 weeks to 10 months, 12 of them having been at home more than 5 months. Thus, too short a time has elapsed since they left the hospital to allow any worthwhile estimate of the permanency of the results obtained by hypoglycemic shock therapy. However, in most instances the improvement has been steadily maintained or there has been further improvement.

At Pilgrim State Hospital the total series of patients who have completed hypoglycemic therapy is 49, of whom 26 have been considered here. Of the remaining 23, two are considered much improved and three improved. Thus the improvement rate is 28 out of 49, or 57 per cent, which obviously falls well below the results obtained in many other series. If one considers the 11 patients whose psychotic symptoms had existed six months or less before treatment, improvement has occurred in 8 of them, or 72 per cent. However, comparing this group with other series, where better results were reported, the favorable response to treatment at least in reducing the period of hospitalization, seems to warrant continued application of this therapy in our State hospitals. Only after some years of use will a true evaluation of the permanency of any good results be obtained. This may necessitate the development of a closer system of followup of our treated patients.

PROGNOSIS IN DEMENTIA PRAECOX

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In attempting to determine the value in Kings Park State Hospital of Sakel's insulin shock treatment, we deemed it essential to have a clear idea of the results obtained in a control group of patients who were treated with the usual hospital methods. That these methods have been effective in the past has been shown by Lewis and Blanchard[1] reporting on one hundred "recovered" cases which had received only institutional treatment with hydrotherapy, ergotherapy, personal protection and a well-regulated regime. Whitehead[2] reporting on 88 cases in the Utica State Hospital, found that 32 showed improvement. He states further that 50 per cent of his cases with a duration of less than six months are improved and 22 per cent can be considered recovered. Strecker and Willey[3] report 25 out of 187 cases of dementia præcox, or 13.3 per cent, recovered, and later they[4] report 38 of these cases recovered after a followup period of five years. Bellinger[5], studying 37 cases of catatonia admitted to the Utica State Hospital, found that 9 were able to remain out for an average of five years. Six of these he considered recovered. Three had made a social recovery with defect.

On the other hand Kraepelin[6] gives a recovery rate of 13 per cent in catatonics, 8 per cent in hebephrenics, and states that the paranoid forms never attain complete recovery. He cites other investigators who report recovery rates varying from zero to one-third.

In view of the lack of agreement among those attempting to estimate the rate of recovery or improvement it was decided to undertake a study upon a group of patients as nearly comparable as possible to those who have received and will receive the insulin treatment.

Recovery, *per se,* does not concern us here. We attempted to formulate objective criteria, using as a basis for our studies only the ability of a patient to be paroled and the ability to complete successfully a full year on parole. If a patient was able to return

home and remain there for a year, we noted it as a fact and made no claims as to the degree of improvement. We were interested to find, however, that 15 per cent of the patients in our paroled group made a good remission, 38 per cent a fair remission, and 47 per cent either made a poor remission or were returned to the hospital before the completion of one year on parole.

We are not justified at the present time in evaluating insulin therapy on the basis of either quality or duration of remission and therefore there will be no comparison of these points with our control group. The quantitative results of the treatment only can be compared.

We studied all cases of dementia præcox admitted to the Kings Park State Hospital from 1930 to 1935, inclusive. We excluded those patients previously admitted to any mental institution, those dying in hospital, those deported to other countries or states, those discharged without having had a period on parole, and those transferred to other hospitals in the State. We believe that the 1,100 cases remaining constitute a control group, by which we can measure the results of insulin treatment or any other rigorous therapy. Our figures are not to be construed as representing recovery rate or gross parole rate. They are figures for a selected group of patients.

The cases were analyzed as to type, age, sex, duration of psychosis before hospitalization, civil status, economic status, duration of hospital residence, parole rate, condition on parole, type of remission and the ability to complete one year on parole.

Relation of duration of psychosis to parole rate

Tables 1, 2, 3 and 4 show that in cases having a duration of six months or less the parole rate in our control group is 46 per cent for the paranoid type and 65 per cent for the other three types. This rate decreases as the duration of psychosis increases so that in individuals who have been sick for more than three years, it is approximately 30 per cent for the paranoid and hebephrenic types. (The number of cases in the catatonic and simple types is too small to be significant.)

TABLE 1. DEMENTIA PRÆCOX—HEBEPHRENIC TYPE—DURATION OF PSYCHOSIS IN RELATION TO PAROLE RATE

	Duration in months				
	6 or less	7-12	13-24	25-36	Over 36
Total admitted	106	52	61	36	125
Paroled	69	22	22	11	37
(Per cent)	65	42	36	30	30
Completing one year on parole	59	17	18	10	21
(Per cent)	56	33	29	28	17

TABLE 2. DEMENTIA PRÆCOX—PARANOID TYPE—DURATION OF PSYCHOSIS IN RELATION TO PAROLE RATE

	Duration in months				
	6 or less	7-12	13-24	25-36	Over 36
Total admitted	138	60	57	40	195
Paroled	64	31	30	12	56
(Per cent)	48	51	53	30	29
Completing one year on parole	52	22	27	10	49
(Per cent)	38	37	47	25	25

TABLE 3. DEMENTIA PRÆCOX—CATATONIC TYPE—DURATION OF PSYCHOSIS IN RELATION TO PAROLE RATE

	Duration in months				
	6 or less	7-12	13-24	25-36	Over 36
Total admitted	99	21	16	10	10
Paroled	64	10	8	5	3
(Per cent)	65	48	50	50	30
Completing one year on parole	61	9	7	3	3
(Per cent)	62	43	44	30	30

TABLE 4. DEMENTIA PRÆCOX—SIMPLE TYPE—DURATION OF PSYCHOSIS IN RELATION TO PAROLE RATE

	Duration in months				
	6 or less	7-12	13-24	25-36	Over 36
Total admitted	12	8	8	15	16
Paroled	8	7	7	10	10
(Per cent)	67	88	88	67	63
Completing one year on parole	6	5	5	6	10
(Per cent)	50	63	63	40	63

Relation of age on admission to parole rate

Tables 5, 6, 7 and 8 show that in the types in which the number of cases is large enough to be significant, the younger the patient, the better is his chance of being paroled.

TABLE 5. DEMENTIA PRÆCOX—HEBEPHRENIC TYPE—AGE ON ADMISSION IN RELATION TO PAROLE RATE

	Age group			
	20 and under	21-30	31-40	41 and over
Total admitted	50	179	100	51
Paroled	36	88	27	11
(Per cent)	72	49	27	22
Completing one year on parole	32	64	21	9
(Per cent)	64	36	21	18

TABLE 6. DEMENTIA PRÆCOX—PARANOID TYPE—AGE ON ADMISSION IN RELATION TO PAROLE RATE

	Age group			
	20 and under	21-30	31-40	41 and over
Total admitted	12	94	203	181
Paroled	8	40	82	63
(Per cent)	67	43	40	35
Completing one year on parole	6	38	64	52
(Per cent)	50	40	32	29

TABLE 7. DEMENTIA PRÆCOX—CATATONIC TYPE—AGE ON ADMISSION IN RELATION TO PAROLE RATE

	Age group			
	20 and under	21-30	31-40	41 and over
Total admitted	37	80	35	4
Paroled	27	45	15	3
(Per cent)	73	56	43	75
Completing one year on parole	24	42	14	3
(Per cent)	65	53	40	75

TABLE 8. DEMENTIA PRÆCOX—SIMPLE TYPE—AGE ON ADMISSION IN RELATION TO PAROLE RATE

	Age group			
	20 and under	21-30	31-40	41 and over
Total admitted	9	27	16	7
Paroled	8	20	11	3
(Per cent)	89	74	69	43
Completing one year on parole	7	14	8	3
(Per cent)	78	52	50	43

Relation of hospital stay to parole rate

We were interested also in finding the average hospital stay of those patients who were eventually paroled. Tables 9, 10, 11 and 12 show that in each type the majority of those paroled left the hospital in the first year of their stay. This finding which may seem obvious at first glance, we feel to be of value in determining the efficacy of insulin used in cases with hospital residence of more than one year.

TABLE 9. DEMENTIA PRÆCOX—HEBEPHRENIC TYPE—DURATION OF HOSPITAL STAY IN RELATION TO PAROLE RATE

	Months in hospital			
	12 or less	13-26	37 or over	Total
Paroled	111	34	17	162
Completing one year on parole	98	23	4	125
Per centage completing one year—(Per cent)	88	68	24	77

TABLE 10. DEMENTIA PRÆCOX—PARANOID TYPE—DURATION OF HOSPITAL STAY IN RELATION TO PAROLE RATE

	Months in hospital			
	12 or less	13-26	37 or over	Total
Paroled	130	56	7	193
Completing one year on parole	109	46	5	160
Per centage completing one year—Per cent)	84	82	71	83

TABLE 11. DEMENTIA PRÆCOX—CATATONIC TYPE—DURATION OF HOSPITAL IN RELATION TO PAROLE RATE

	Months in hospital			
	12 or less	13-26	37 or over	Total
Paroled	70	15	5	90
Completing one year on parole	68	13	2	83
Percentage completing one year—(Per cent)	97	87	40	92

TABLE 12. DEMENTIA PRÆCOX—SIMPLE TYPE—DURATION OF HOSPITAL STAY IN RELATION TO PAROLE RATE

	Months in hospital			
	12 or less	13-26	37 or over	Total
Paroled	24	12	6	42
Completing one year on parole	21	10	1	32
Percentage completing one year—(Per cent)	88	83	17	76

COMPARISON OF CONTROL GROUP WITH INSULIN-TREATED CASES

Insulin therapy has been completed in 74 cases. Of these, 39, or 53 per cent, have been paroled and 5 have been returned from parole after failing to make a satisfactory adjustment in the community.

When we compare the duration of the psychosis with the parole rate, we find that:

Of 8 patients with duration of less than six months, 8 were paroled;

Of 28 patients with duration of 7 to 18 months, 16 were paroled;

Of 38 patients with duration of over 18 months, 15 were paroled.

Expressed differently, we find that 25, or 62 per cent, of 40 patients who have had their psychoses for two years or less, have been paroled. In the control group on the other hand 342, or 54 per cent, of 638 patients who have had their psychoses for two years or less, have been paroled.

It has been stated[4, 7] that an acute onset offers a more favorable prognosis than a gradual or insidious onset. Our figures would

tend to bear this out since 44 per cent of patients having a gradual onset were paroled whereas 58 per cent of patients with an acute onset were paroled.

We find in our control group that heredity plays little part in determining prognosis. Forty-four per cent of patients having a negative heredity were paroled whereas 42 per cent of those with a tainted family history were paroled.

Comment

We recognize that our parole group presents definite limitations and our selection of such a group leaves us open to criticism. However, we feel that the results obtained with this control group indicate that further studies along the same line will prove valuable. We feel further the importance of establishing definite objective criteria by which the quality of the remission can be judged.

Conclusions

1. Schizophrenic patients who have been treated with insulin have a fairly high parole rate. In our series, this rate is 62 per cent for patients who have been sick two years or less.
2. Those who have been treated by routine methods also have a fairly high parole rate. In our control group, the rate is 54 per cent for patients who have been sick for two years or less.
3. The difference in parole rates in the two groups is perhaps small enough to be accounted for on the basis of the more personalized care on the insulin wards. Statistical error must also be taken into consideration.
4. The quality and duration of the remissions in the two groups must be compared before we can decide for ourselves the value of insulin therapy in Kings Park State Hospital.

REFERENCES

1. Lewis, N. D. C., and Blanchard, E.: Amer. J. Psych., 11:481, 1931
2. Whitehead, D.: Psychiatric Quarterly, 11:383, 1937.
3. Strecker, E. A., and Willey, G. F.: Amer. J. Psych., 3:593, 1924.
4. Strecker, E. A.: Proc. Assn. Res. Nerv and Ment Dis, 10:11, 119, 1929.
5. Bellinger, C. H.: Psychiatric Quarterly, 6:475, 1932.
6. Kraepelin, E.: Dementia Præcox and Paraphrenia. Transl. by R. M. Barclay. Edit. by G. M. Robinson. E. S. Livingstone, Edinburgh, 1919, pp. 181-189.
7. Hinsie, L.: Proc. Asso. Res. erv. and Ment. Dis., 10: 1929.

THE INTERPERSONAL CONTENT IN SCHIZOPHRENIC THOUGHT*

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The objective of the following pages is to study the interpersonal element in schizophrenic thought; to trace it through the delusions, hallucinations and other symptoms typical of the disease. In this way an effort will be made to find out to what extent the awareness of people or of dramatic relationships towards people colors the typical schizophrenic mental picture. An attempt will be made to show that schizophrenic thought is "interpersonalized," one may say perhaps, to an extremely high degree; that as a matter of fact this would seem to constitute one of the striking peculiarities of the disease. Lastly an effort will be made to compare the schizophrenic interpersonal experience with the normal.

In such a study it should be emphasized that the interest is not primarly in mental content *per se,* that is, the ideational content of the delusion, hallucination, etc., nor in the various dynamic explanations of this content. *The question is simply whether or not schizophrenic mental content typically shows an awareness of other people, or of a dramatic relationship towards people.* Thus of necessity our approach must be a descriptive, for the most part, phenomenological one which will deal with the inner texture of the morbid thought process itself.

Now if it is clinically true that schizophrenic mental content is highly interpersonalized in the above sense, we seem to be approaching a paradox. In the first place, the concept of narcissism as applied to the disease contains the notion of a drawing-in, onto the self, of libido which had become attached not only to the outside world of things and people but also to phantasy[1]. When the student attempts to form a picture of this situation in his mind he is apt to picture to himself a type of thinking which would be "impersonal" or "first-personal" (to use a rather bad figure of speech), at least a mental content which would be totally absorbed in the self and free from much dramatic interplay. At the same time certain broadly accepted present-day psychobiological principles lead the investigator to the same phenomenological fallacies.

*Read at the ninety-third annual meeting of the American Psychiatric Association, Pittsburgh, Pr., May 10-14, 1937.

Thus the preschizophrenic individual, it is well established, is likely to be aloof, seclusive and antisocial. For the majority of candidates for the disease, this is undoubtedly true. It is also true that when the disease is established, these "shut-in" qualities are still more pronounced and the patients are still more seclusive and reserved. Here again outward behavior and social adjustments throw us off the track and we assume a mental content which would be impersonal and free from much interpersonal coloring.

However such assumptions are not altogether in accord with clinical findings. For in spite of the many striking differences between normal and schizophrenic thinking, the latter is found to be surprisingly "interpersonalized," that is, dominated by the awareness of people, by the awareness of personal influences and other various forms of dramatic rapport. In fact it is quite possible that the characteristic thinking of schizophrenics is more strongly colored by interpersonal forces than is the case with the normal.

As a concrete example of what is meant by an "interpersonalized" mental content let us observe the following not unusual case of a woman diagnosed schizophrenic who for years had shown disturbed episodes of a rather peculiar nature. At such times the patient, who was extremely disturbed and out of contact, would sit off in a corner of the ward talking to herself excitedly in an odd, affected manner, and striking at the air. Afterwards in a clear state, the patient, who was a woman of considerable intelligence and insight, described her psychosis as follows. She remembered that during this period she had felt herself to be constantly surrounded by her own immediate family. Although she did not hear their voices, she was intensely aware of their presence as she struck and hurled abuse at them. We will not go into the history of this patient nor the dynamic factors which had given rise to this situation. Here we concern ourselves only with a description of this patient's mental content. In this case we might speak of "presences," which harrass the patient, of which she is intensely aware and which moreover fade into the background as the patient recovers and renews her interest in the objective, outside world.

In such cases the question of hallucinations naturally arises. Here they could not be established during a cooperative period, nor was there a well-defined projection mechanism. Thus, essential to such a picture as the one described above is this intense awareness of people, of dramatic participation; and the entire episode seems like some very vivid phantasy which the patient has to act out in disregard of reality. Accordingly in describing the mental content of this patient, we can speak of an excessive "interpersonalization" of the thought processes, of a "dramatic formulation" as the most outstanding single, morbid feature. It is seldom that the schizophrenic mind permits itself to be explored very deeply. At any rate, the phenomenology of the disease has always been a difficult subject. With an eye for such much more striking phenomena as projection, automatic thinking, etc., a routine examination would probably have taken for granted the most characteristic and outstanding feature in the above symptom complex.

But before the interpersonal problem is taken up in more detail, it must be conceded that in some instances an "interpersonal orientation" does not seem to dominate the schizophrenic picture. It does not seem to be clearly demonstrable in those cases where hypochondriacal ideas of bodily change are outstanding. Here the patient seems to be aware only of the self, or rather of the body. Usually he does not feel himself to be in dramatic relationship to anybody else. Thus the patient feels, for example, that his blood has turned to water, or that his lungs have been sucked dry. During this period of the psychosis he is totally absorbed in the self and has not yet asked who is doing these things to him or why they are being done. The same may be said of those cases with depressive ideas of world destruction, or of cosmic change. That at least is the writer's observation with the few cases studied. Now it is interesting that both of these clinical pictures are seen, if at all, at the beginning of the disease or during an acute shift leading over in the course of months or years to the more usual paranoid or hebephrenic symptom complexes.[2]

But despite these two rather exceptional pictures, as well as others which may suggest themselves to the clinician, it can be

stated that the thought content of the schizophrenic is surprisingly "interpersonalized," that is, dominated by the awareness of other people or by dramatic attitudes of various kinds.

For example let us deal first with hallucinations. In most instances these occur while the patient is "oriented interpersonally." The patient hears a voice but at the same time is almost always aware of some dramatic relationship towards the voice, that is, towards the person speaking. The voice chides or praises, or possibly speaks nonsense which he has difficulty in understanding. For the patient, however, the hallucination usually has some dramatic meaning.[3]

Thus we may speak of "dramatic frames of reference" as being more or less essential to the structure of the typical schizophrenic hallucination. As clinicians our attention is usually directed elsewhere—projection clarity, quality of the hallucination, compulsive power, etc. Although these latter are striking aspects of the hallucination and to be sure, interesting in themselves, much more central to the disease is this habit of dramatization; of wresting apparently neutral material out of its context to give it special dramatic significance. As a further example the phenomenon of "thought hearing" usually represents the interpersonal situation under another aspect. Usually here the dramatic situation is not so pronounced. Questioning, however, will usually reveal the fact that the patient is not alone with this symptom. In most cases the patient feels that his thoughts are being spoken by someone of whose presence he is aware. For example one of the writer's patients stated that her thoughts were spoken for her by a Mr. X, a former friend whom she neither loved nor hated but of whose presence she was intensely aware.

Before leaving the subject of hallucinations, let us refer back to one clinical group which seemed to form an exception, that is, those patients with somatic hallucinations or ideas of bodily change. Here it is found that even these somatic feelings usually come to take on an interpersonal coloring in the course of time. A patient, for example, during an acute shift experiences electric shocks through her arms. Gradually she begins to realize that they have their source in some personal influence, that for example

they are put on her by some man who may live in another part of the hospital. Another elderly patient speaks of being "superheterodyned" through her vagina. Here she is conscious of her minister as the exciting agent.

In short, we often see an awareness of people, *usually in a dramatic type of relationship.* Thus typically, the schizophrenic mental content will show that the patient hears the voices of people, that possibly people watch him, persecute him, influence his thinking or deprive him of thoughts, control his movements and exercise a most manifold influence over him. Even in the rigid, grandiose attitudes with their attendant delusional formations we may assume dramatic, interpersonal frames of reference—a persistent interpersonal attitude which the patient feels towards the rest of mankind. And as has been seen in the first case mentioned, occasionally this intense and excessive interpersonal coloring of the thought stream can be observed where there is very little else in the way of morbid symptoms.

As might be expected, the illusions characteristic of the disease betray the same dramatic orientation. That is an essential part of all catathymic distortions of sense perceptions. Finally even hallucinated animals, "shapes" and other indefinite malign presences tend to become personalized, to assume personal, human qualities much as one sees in primitive and archaic thinking[4]. A patient speaks of the snake which comes into her room at night as an "artificial" snake. Here her language and attitude clearly indicate that she has personalized it.

It would be tempting to continue citing examples, but to anyone familiar with the clinical manifestations of the disease, this point has been sufficiently stressed. Schizophrenic thought, as reconstructed or observed directly, typically has an extremely strong interpersonal coloring. That is, quite typically the patient is sensible of a dramatic relationship between himself and other individuals or indefinite groups of people. Whether we are dealing with hallucinations, delusions or some psychic complex for which we would be at a loss for a formal, descriptive term, this would seem true. Thus in the background, operating as a dynamic moment giving shape and coherence to the distorted thinking, there may be

assumed certain interpersonal patterns or "structures" as a reflection of which in consciousness the patient becomes abnormally aware of people and of dramatic relationship. Such include those with friends, lovers, persecutors, relatives or larger indefinite groups; or again vague, "numinous" presences[5], animals and other objects which have been made to become human and magically-endowed personalities.

Now it is interesting to correlate this "interpersonalized" thinking with the seclusiveness, the "shut-in" qualities which are also a symptom of the disease. *For it is a well established clinical fact that the schizophrenic is unable to handle real and actual interpersonal relationships*—situations where the patient is actually thrown into contact with people. In these individuals there is usually a long history of maladjustment and social failure—in school, in work and in social and erotic relationships.[6] As clinicians we see the same defects in our direct contact with them, obviously to a much greater extent, after the disease has become established. Bleuler has mentioned the fact that one feels emotionally more in contact with an idiot who does not utter a word than with a schizophrenic who can still converse well intellectually but who is inwardly unapproachable. Thus in his dealings with real living people, the schizophrenic shows a characteristic deficiency. Whether as a result of this deficiency or for other unknown reasons, the patient gradually draws away from human contacts, and comes to live more and more within himself. May we assume that the inner thoughts of the patient become, so to speak, crowded and obsessed with people and dramatic relationships? It is as if failure in one sphere, led to some sort of compensation in the world of phantasy.

In his "Introduction to Narcissism," Freud has made mention of the apparent narcissism of some of the larger carnivora, alluding in rather figurative language to the aloofness and self-sufficiency which characterizes these animals. Such a state of affairs would also seem to describe the outward behavior of schizophrenics. As has been seen, they are outwardly seclusive and there seems to have occurred some relaxation of those cohesive, socializing impulses. The latter, Trotter has described as the "herd instinct" and to them he has ascribed extremely ancient phylogenetic

roots. But here again, if one penetrates the outward picture into the inner mental content, one finds these patients inordinately sensitive to the "herd" (used in the above special sense). Therein is found an *awareness of people or of dramatic attitudes* as a constant feature running through the entire symptomatology of the disease.

At this point it is obvious that a considerable effort has been made to contrast the *behavior* of the schizophrenic with his *mental content.* This leads again to the psychological paradox to which reference has already been made. The seclusiveness and egocentricity of the schizophrenic is an undoubted clinical fact. However it is important to bear in mind that this refers only to the outward behavior of the patient, to actual social adjustments, in short, to the behavior during real contacts with his fellow beings. But when the trouble is taken to examine the complexion of the thoughts, one can figuratively speak of these thoughts as being excessively "peopled," that is, even more highly interpersonalized than in normal thought. Characteristically the mind of the schizophrenic does not dwell on things but on people. Inquiry will show very little that is objective or dramatically detached in the thinking of these patients whom we see sitting around the wards like so many socially insulated units. Usually they are too busy "hearing voices." Surrounded by phantom people and beset by personal influences, the schizophrenic has little interest in the objective and impersonal world around him.

What then more precisely, is the nature of the schizophrenic's interpersonal experience? What are its distinguishing marks which make it differ from the normal?

Before proceeding, it is obvious that the terms "interpersonal" and "interpersonal thinking" have been used with considerable looseness and freedom. In reality these terms must be applicable to a vast range of normal and abnormal mental activity, or ways of becoming conscious. All these forms of mental activity, however, would have as a common principle the fact that they arise whenever an individual either in phantasy (broadly speaking) or as an actual experience, becomes cognizant of another individual or comes to feel any sort of dramatic relationship.[7]

Now as we proceed to the more critical scrutiny of interpersonal experience, we can dismiss the *actual* interpersonal experience, the feeling tone associated with the actual contact of other personalities, as unimportant in this discussion. Shorn of its warmth and emotional rapport, this type of experience would seem to enter into the emotional life of the schizophrenic only rarely or in a reduced and imperfect form.

For a more precise analogy of what may be assumed to be the type of interpersonal feeling experienced by the schizophrenic, let us first turn our attention to phantasy material. This material is accessible and lends itself fairly easily to introspective scrutiny. Here most investigators would appear to have neglected the interpersonal in favor of the more striking visual components. Varendonck[8] for example, views the phantasy as a sort of silent moving picture and describes captions alternating with "shots." It is true that the visual element is present and undoubtedly important. In this connection one also thinks of the eidetic imagery said to be more prominent in schizophrenics[9], the visual thinking of savages and the symbol-like formations of schizophrenic thinking[10].

In phantasy, however, one can easily discover that the fashioning of dramatic situations is by far the more important characteristic even from the descriptive standpoint. After the cessation of a chain of phantasies, usually the only recognizable remnant is the characteristic interpersonal tension. Moreover in phantasy, the dynamic pull of specific, concrete personalities is at a minimum; the dramatis personae are not vividly felt, their presence is merely subsumed so that the much more central dramatic situation can be built. Here the visual components serve merely to clothe these dramatic kernels[11] in time and place, giving them substance and locale. Further, it is to be noted that compared to actual interpersonal situations, the drama of phantasy appears like a pale, shadowy reflection.

Other normal autistic states taken at random show much the same type of interpersonal coloring. Thus one thinks of worrying states in contradistinction to "physical fear." Introspection will almost always show that worry envisages loss of love, loss of prestige or some other interpersonal calamity of a disagreeable

nature. And here again it is the strong painful dramatic feelings which are uppermost and which usurp our proper judgment of the personalities and the logical possibilities involved.

Unfortunately because of the nature of the material, any close introspective study of dreams is out of the question. However there is indirect evidence enough. For one of the most important objectives of psychoanalysis is the unravelling of the interpersonal forces behind the dream structure.

The notes above relating to the autistic episodes of normal thought have been made only with the purpose of giving by analogy what may be assumed to be the more precise nature of the schizophrenic interpersonal experience.

Here we have an important clue as to the essential nature of these processes. Normally in extrovert and realistic thinking, that is, those patterns employed in "meeting reality," the awareness of other persons to a great extent tends to be unconscious or at least dimly felt. The mind is more centrally employed with something else. But in autistic thinking we see interpersonal awareness concentrated and as it were crystallized out from other more normal patterns.

To clarify these ideas, let us resort to the following rather crude scheme. First of all, let us speak of an A versus B relationship in which A would be merely aware of the presence of B in varying degrees of intensity. (Conf., the cases of thought hearing referred to above.) Secondly, we can picture an A. versus B relationship where a dramatic nexus enters and becomes more prominent; where A feels himself in some strong dramatic relationship towards B, whether of love, hate, feelings of sexual influence or any of an almost countless number of ways. (For example, the common paranoid situation: feelings of control, influence, "stealing of strength," etc.) Lastly, and much more significantly for our purpose, one can envisage a situation which might be called simply "A versus," in which B is indefinite; in which for patient A, B does not stand for a definite personality. Where, for example, the feelings of persecution or influence are very vaguely referred, or where a rigid attitude of grandeur, exaltation, silliness, etc., becomes the most outstanding feature. It is in such cases for ex-

ample that the patient speaks of the voices which are made for him, or of an indefinite "they" which is following him or persecuting him. In such cases the identity of the antagonist becomes extremely vague or cannot be recognized at all, so that there comes to be nothing but indefinite, vaguely referred feelings of reference[12].

Thus one observes here that characteristically the dramatic feelings are undirected or are very poorly directed. Also that these dramatic feelings have what might be called an undifferentiated, generic quality as they rise and fall autistically without much reference to reality. Here one may speak perhaps of an assumed pose, a dramatization, or theatrical subsumption which seems to be felt as an end in itself, needing no real flesh and blood antagonists for its proper fruition. Finally, it is only in this last sense that the richly interpersonalized thinking of these patients can be described as narcissistic.

As an explanation of these descriptive findings, one is tempted to fall back on those structural interpretations which view the disease process as a disruption and fragmentation of more complex patterns into simpler ones[13]. This breaking up of pattern continuities would appear to be fundamental to this form of reaction pattern. While perhaps most marked in catatonic excitements, it can be easily observed in thought and meaning configurations where one observes quite an analogous type of disorganization, usually with the appearance of associational schemes of less complexity. Thus one thinks of the thinking and feeling patterns of autistic thinking, of the "reduced" schizophrenic ego with its relaxed associative tensions (Berze), as being structurally less complex than those patterns which in normal thought result from the impact with reality.

Reality introduces complexity, and interpersonal feeling is probably never absent from consciousness—normal, autistic, or in the "hypotonic" consciousness of schizophrenia. The interpersonal feelings associated with this latter condition might be urged to have a special, simple, generic quality which probably results from the lessened complexity and disorganization of patterns which we

may assume to be an essential feature of the more typical schizophrenic mental processes.

A concept of the clinical picture of schizophrenia has been presented here which varies from that usually held, but which may aid in understanding that disorder.

REFERENCES

1. Freud: "On narcissism: an introduction." Collected Papers, Vol. 4. Also Rickman: "The development of the psychoanalytic theory of the psychoses,' 1928.
2. Conf., Bleuler; Storch.
3. Bleuler speaks of the schizophrenic hallucination as being "closer to the ego." Textbook, p. 67. Elsewhere he says that the schizophrenic hallucinates the meaning (i. e., interpersonal; dramatic) rather than the word. Ibid., p. 389.
4. Conf., especially under animism, Levy-Bruhl, Storch, Fraser.
5. Conf., the "numinous disposition." Storch: "The primitive archaic forms of inner experience and thought in schizophrenia," pp. 41, 63.
6. Hoch, August: "Constitutional factors in the dementia præcox group." Rev. of Neur. and Psych., Aug., 1910.
7. We are not justified in calling these feelings unconscious just because they are unclear. Lack of clearness is characteristic of all feeling. For example conf., E. B. Titchener: "The psychology of feeling and attention," pp. 69, 77, 180, 334.
8. Varendonck: "The Psychology of Day-Dreams."
9. Jaensch: Zeitschrift für Psychologie, Vol. 85.
10. Storch: Ibid., p. 9.
11. For an analogy, compare the "thought kernels" of William James: "Principles of Psychology," Vol. 1. p. 255.
12. Also compare the frequent prodromal "insane mood" as described by Storch. Ibid., p. 61. Also Jaspers: "Allgemeine Psychopathologie," p. 78.
13. E. g., Stransky, Bleuler, Berze, etc. For a summary, conf., James V. May, "The dementia præcox-schizophrenia problem." Am. J. of Psychiatry, Vol. 11, new series, pp. 411-429. Also Storch: Ibid., p. 101.

BOOK REVIEWS

Historical Notes on Psychiatry. By J. R. Whitwell, M. B. P. Blakiston's Son and Co., Inc., Philadelphia, 1937. Pages 252. Price $4.25.

Much careful study of ancient writings has gone into the making of this book. It covers the period from the earliest decipherable records—from about 3000 B. C. to the end of the sixteenth century. The earlier references are scattered and brief, as the reference to senile decay made by Prince Ptah-hotep: "The heart grows hard and remembers not yesterday."

In the early temples of Egypt, one reads, measures of treatment were carried on that would be creditable to a modern mental hospital. Games and recreations, walks in the temple gardens, dancing, concerts and sports were the measures employed. However, the belief was then as later that mental disorders were due to indwelling spirits and when recovery took place, the credit was given to the tutelary diety just as it was at Gheel four thousand years later when it was ascribed to Ste. Dymphna.

Throughout the long period of Jewish history covered by the Old Testament, the idea that mental disorders and epilepsy were the result of possession by spirits prevailed generally. Dr. Whitwell points out by quoting from Snowman* that the Talmud, that great encyclopedia of Jewish law, custom, discussion and opinion, makes no suggestion that such disorders are due to possession by evil spirits. The Talmud was compiled over a period of about eight hundred years (300 B. C.—500 A. D.), at a time when Western thought, as well as that of Palestine, was permeated with ideas of demoniacal possession. This seems to indicate that the Jewish theologians and scholars possessed truer insight than would be surmised from reading the books of the Old Testament. These books were put into writing about three centuries before the Christian era and leaned heavily upon tradition and folklore derived from ancient sources. The Jewish scholars, whose writings comprised the Talmud, evidently disregarded the superstitions then current, for their references to mental disorders and epilepsy indicate that they were regarded as diseases.

The theme of the narrative is carried on through the period of Hippocrates, Galen and other classical medical writers, to the time of Felix Plater. The account of the dark period of the Middle Ages contains interesting biographical sketches of the leaders of thought during that period and traces the beginning of a truer understanding of the nature of mind and its disorders, which has had such notable development in recent years.

*J. Snowman. A Short History of Talmudic Medicine, (London) 1935.

Cornelius Agrippa recanted earlier belief in the occult and in the influences of the stars when he said that "such theories were built upon no other foundations but upon mere trifles and feignings of imagination." He repented that he had given credence to such vaporings and desired to erase the remembrances of them. St. Vincent de Paul about the same time, though surrounded by every opposing opinion and influence, declared "Mental disease is no different to bodily disease and Christianity demanded of the humane and powerful to protect, and of the skillful to relieve the one as well as the other." The struggle to shake off the thralldom of the old and to seek enlightenment in the new was bitter and prolonged.

Whitwell goes over much the same ground in this book as is covered by Andrew D. White in his *History of the Warfare of Science with Theology in Christendom* in the section entitled "From Demoniacal Possession to Insanity." The latter book has long since been out of print. Its scope was narrower and the author's tone was rather bitter in its denunciation of the ignorance of the ecclesiastics and scholars of the Middle Ages. Whitwell's treatise is more complete, is written in a more judicious style, and it presents the important topics which it covers in a readable manner with great accuracy, checked as it is, step by step, by references to and quotations from earlier authorities.

It is to be hoped that Whitwell will carry on his history in another volume to bring his narrative on to the present day. Such a volume would be another welcome addition to psychiatric literature.

Introduction to the Rorschach Method. A manual of personality study. By SAMUEL J. BECK, Ph.D. Monograph No. 1 of the American Orthopsychiatric Association, New York. 1937. xv+278 pages. Price $4.00.

This book is the fruit of 10 years of experience. The author's intention was to write a manual for the use of beginners, who, however, have had some experience with the method. He has succeeded in achieving his aim. The book makes no claim to a full description of the Rorschach inkblot method of personality analysis, Rorschach's own monograph still being by far the best single reference in this field. In his manual, Beck demonstrates the uniform application of a limited number of interpretive principles to 59 different records obtained from superior healthy adults, feebleminded and problem children, schizophrenics, neurotics, hypomanic and depressed patients. The author does not utilize all the information which these records contain. Consequently, he often fails to give a complete picture of the

patient's total personality, his interpretations usually consisting of observations pertaining to specific personality traits. This rather sketchy type of personality analysis is a natural result of Beck's methodological attitude. Through the use of statistical tables, he attempts to make the interpretation of Rorschach records as objective, that is, as automatic as possible. The chief advantage of such a methodological attitude is the facilitation of the use of the Rorschach technique for beginners.

On the whole, Beck closely follows Rorschach. His own contributions pertain chiefly to the following: (1) the determining of the degree to which the subject's interpretations fit the respective inkblots, or the problem of the sharpness of form, (2) the organization response, or the degree of perceptual differentiation of the inkblot responses, and (3) the numerical diagnostic criteria, or the systematization of psychiatric diagnosis. The problem of sharpness of form has received a great deal of attention in Rorschach literature. Beck implies that the frequency of a response has determined his scoring of it as F+ or as F—. Such a statistical criterion does not take the following facts into consideration: (a) there are rare responses the form of which is very sharply perceived, and (b) similar or identical words are not always based on the same perceptions. An injuiry following the examination proper will, in nearly all cases, remove any doubt as to the quality of the subject's perception. Beck's "organization response" is a systematic elaboration of Rorschach's combinatorial whole response. The degree of "organization" used together with other Rorschach factors is a reliable index of the level and type of intelligence. This "organization response" is Beck's chief contribution to the furthering of the objectivity of the method. His diagnostic criteria are contained in Tables XIV and XV. He warns us that these tables are provisional but it can be seriously questioned whether the factors contained in the diagnostic tables would ever prove to be a sufficient basis for making valid Rorschach psychiatric diagnoses. The author's own interpretations rightly go beyond the factors contained in the tables and readers planning to use his tables should keep this fact in mind.

The beginner with the Rorschach method will probably derive the greatest benefit from this manual—the writing of which must have required a great amount of labor—if he carefully reads Beck's interpretations of the records and checks each statement in the interpretations against the actual records. The manual is preceded by a pertinent and instructive preface by Dr. F. L. Wells.

Social Behaviour and Child Personality. By LOIS BARCLAY MURPHY. Columbia University Press, New York, 1937. 325 pages. Price $3.50.

Refreshing by reason of its aim to discover the origins of sympathetic behavior in contrast to the welter of current studies of childhood resistance, aggression and the like, this book is well written and based upon sound research. Therein sympathy implies seeing and feeling the distress as the other person does, and doing something about it which he would want done. Sympathetic response is considered as merely one expression of the total personality of the child, in the combination of forces including his constitutional makeup, previous experience, position in the group and cultural background. The author makes some well-taken points with reference to larger sociological and psychological implications concerning the latter, in the course of evaluating her material.

The viewpoint may be judged from the following: "If we see a particular child's behavior . . . as a range of possible behavior within which general tendencies toward outgoing responses, stable traits, and dominant habits are given their place, we may have a more dependable framework for an approach to personality." This latter at any given time, is developed to mean "the range of responses and their various modal or peak points, elicited by the range of situations to which (the child) has been and is exposed."

The material consists of observational records, teachers' ratings, and observations of "framed situations" over a long period, made upon several groups of nursery-school children. These varied with reference to age, socio-economic status and the physical situation. The observation of play activity was recorded verbatim and an objective interpretation was striven for, as this quotation may indicate: "In the following situation, Wallis' apparently considerate warning of Jude turns out to be a precaution against damage to his own property:

February 14, 1934.

> Jude approached Wallis, who was playing with a train; he had to step over the train to get by. Wallis said, 'Don't fall; and don't knock it down.'

The fact that he was usually very considerate of other children, gives weight to the conclusion that the intention of protecting the other child and that of protecting his own property were both present however."

The forms of sympathy are differentiated later in detail.

The "framed situations" consisted of exposure of the child to a smaller child in a position calculated to excite sympathetic response, or to pictures

similarly planned with controls, or to situations revolving about furry animals (rather than turtles!), for instance.

Results reduced to statistics reveal for this particular nursery school setup a correlation of 0.78 between sympathetic and cooperative behavior, and 0.41 between sympathetic and aggressive behavior. In moderate degree it was found that aggression may be simply one form of outgoing social response together with sympathetic and cooperative behavior. On the other hand too, low ranks on all three aspects of social response suggested a general social inhibition.

Having in mind other cultures such as that of the Eskimo, Russian or Arapesh, the society of the nursery school does not differ from that mixture of competition and cooperation, aggression and sympathy, attack and comfort, ego-values and love, characteristic of American culture. One, by the way, the author believes, in which an ego-superego-id theory of personality development is acceptable.

Age and intellectual differences are associated with higher numbers of sympathetic responses in this material but individual personalities accounted for large variations. Other factors included the age constellation of a given group, the per capita play space, and the varied teachers' techniques. From a prognostic standpoint, the child who could be sympathetic without imposing himself unnecessarily and could defend himself but had no aggressive compulsions, in the author's opinion, seemed less likely to develop later psychoneurotic reactions. No clear evidence of sex differences in sympathetic behavior was adduced. The conclusion that "variation in the security of the child is . . . one of the most important sources of fluctuation in sympathetic response (on the playground), and results in different shifts from one child to another," is supported by case material. On the other hand the variations in response to the "framed situations" seemed to reflect "the specific awareness, anxieties and fantasies that have grown out of home and school experiences." Incidentally, social traits are neatly defined as "functional emergencies from the total situation of child-in-group, in a particular cultural setting" (in contrast to gesture habits or coordination). The earliest sympathetic behavior, according to the author, is a crying response to the crying of another child as early as four months.

The reviewer was nonplussed by the following rather broad statement despite its context, questioning the interpretation of every social overture in terms of dominance: "This argument is a good deal like the argument that everything one does is selfish, because he does it obviously for his own satisfaction. Both pieces of sophistry are confusing and destructive to clear thinking." The observation however that the adult shocked by the "hard-

ness'' of young curiosity in the child's first experience of death somewhat removed, forgets that here curiosity and sympathy may, simultaneously, both be genuine, is singularly apt.

The book is completed by two appendices, one consisting of a social behavior scale; the bibliography is listed and the index seemed inclusive.

This small volume will profit many who deal with people whatever their chronological or emotional age, and whether at home or professionally. Notably, even the case records are graphic.

Modern Discoveries in Medical Psychology. By CLIFFORD ALLEN, M. D., M. R. C. P., D. P. M. Macmillan and Company, Ltd., London, 1937. 280 pages. Price $2.75.

A welcome visitor to the office of the editor is a text which, like the present one, is clothed in clear, concise phraseology, yet whose condensation has not interfered with accuracy and thoroughness. That the author is qualified for his chosen task cannot be doubted; he is psychotherapist to the Institute of Medical Psychology, and chief clinical assistant to the psychiatric department of Charing Cross Hospital. Some of his previous work has appeared in the Psychoanalytic Review.

Primarily this book is intended as a supplement to the library of the general practitioner, whose psychological background is generally long on academics and short on dynamics. The time range implied in the word ''modern'' begins with Mesmer and concludes with Pavlov. Allen views modern psychotherapy as having arrived through three stages:

Stage One embraces the period of accumulating facts; this stage he dates with Mesmer. Stage Two brings on the examination of facts, which Allen says is characterized by the work of Janet and Prince. The final stage, that of the deduction of laws and the prediction of events from those laws, he assigns to Sigmund Freud.

To Janet, the author ascribes credit for opening the door to the study of abnormal psychology; of Prince, he says that his ''contribution to the study of abnormal psychology lies less within the realm of treatment than within the understanding of the basic processes without which it is impossible to develop a mode of therapy.'' This takes us through page 87. From this point, to page 219, there is a splendid exposition of the rise of the psychoanalytic school. The trained and well-read psychiatrist will find little that he does not already know, but wherever the desire for progress in mental health is strong, there Allen's book will do good service.

Kretschmer and Pavlov are the subjects of the two last chapters. The body types of the former are discussed and appropriately illustrated. The

contributions of the latter, Allen considers to be of incalculable value. The fond hope is expressed that Pavlov's work may eventually bear fruit on the psychoanalytic tree: "We cannot help agreeing (with whom?) that his work is even more fundamental than Freud's, and that eventually it may lead to something of great value. If only it leads to shortening of the long period necessary for treatment by analysis it will be a wonderful step forwards." This statement follows the drawing of a comparison between Pavlov's description of the neurosis ("conflict of inhibition and excitation") and Freud's ("repression of emotion, which we may look upon as merely a form of excitation").

It will benefit the practitioner to read this calm, well-written treatise on modern discoveries in medical psychology, which proceeds in orderly manner, with transitions from period to period carefully noted.

The Psychology of Dealing with People. Appealing to the want for a feeling of personal worth. By WENDELL WHITE, Ph. D. The Macmillan Company, New York, 1937. 252 pages. Price $2.50.

Strong Adlerian currents run through this latest addition to the How to Win Friends, etc., school. Not only in the subtitle, but upon page after page, the author emphasizes the theme of "appealing to the want for a feeling of personal worth." Moreover, when psychotherapeutic knowledge is summoned for support, it is nearly always a case of Adler's that is used for illustration.

The writer anticipates that his chief reading audience will comprise students in elementary or applied psychology courses; nor is it amiss for him to feel that "anyone desirous of improving his human relationships" will also find value in the book. For the psychiatrist, however, he has little to offer.

Part One, covering 118 pages, is entitled Dealing with People in Life Situations in General. Its seven chapters smack of the salesman's manual of technic; one feels that White engages himself more in the composition of exercises in propaganda than in the promotion of mental hygiene in the larger social sense. As a matter of fact, the reviewer could not make up his mind whether White was on the side of the slogan-makers, breathing sly suggestions into their ears, or was coming to the rescue of the poor fellow whose feeble sales resistance could be fortified by a brief glance at human motivation. A chapter on "removing objectionable ideas inoffensively" appears little more than a handbook of English composition, in search of the *mot juste.*

Parts Two, Three and Four represent an effort to peer within the com-

plex machinery of the personality, but succeed only in offering a hodge-podge of maladjustments, poorly arranged and superficially described. The phraseology is loosely handled, and the chapter headings are obviously designed to catch the eye of the dabbler in drawing-room psychology. Witness the following: Preventing Wrongdoing, Preventing Peculiar Behavior, Simulating or Developing the Quality Opposite to One's Deficiency. The last is offered as a form of repression (!).

Furthering Mental Health brings the book to a close. The reviewer thought that here was something into which he could dig his teeth. It was rather weak stuff, however, and the style is so near to that of the primer, that it makes for greater abstruseness than if it were in the most involved terminology. The worth of the author's statements is injured by many generalizations, but there may be spots here and there which have prophylactic value in the light of mental hygiene.

The Human Mind. By KARL A. MENNINGER, M. D.. Alfred A. Knopf, New York, 1937. 487 pages with bibliography and index. Price $5.00.

This, the second edition of Menninger's popular volume presenting the facts and findings of psychiatry in an easily assimilable form for the layman or beginning student in the field, has many new features. The first one striking the reader is the improved format adding much to the physical appearance and readability of the work. This item although intellectually of minor importance should add to the popularity of the volume in this era of sales appeal vs. sales resistance, removing as it does some of the mental hazards from the path of the reader.

More pertinent, however, is the improvement of the textual matter presented and the retention of the many favorable features of the first dition. As before, the presentation is factual but tempered by that easily comprehensible and somewhat dramatic style which is so necessary in capturing the interest of the general public in a subject. For the medical student or psychiatric nurse or interne, this type of presentation also assumes importance leading as it does to a stimulation of interest in the subject and a desire for further knowledge. The first edition apparently accomplished this purpose as is indicated by the many requests received by Dr. Menninger and described in the preface, for more material on treatment and for a bibliography which had not been included therein. This present revision therefore includes a reasonably extensive bibliography of the standard and accepted material bearing on the various phases of psychiatry and psychology. The system of footnotes has been expanded and improved to furnish references

to the more scientifically trained reader desiring further information on details.

Outstanding in the textual improvements is the rewritten and added material on psychoanalysis in which the subject is presented in a manner to arouse intellectual interest and allay emotional antagonism. The illustrative case reports, uniformly good throughout the volume, verge on the brilliant in this connection. Other improvements include an excellent discussion of the problems presented by suicide with the reasons for, the psychoanalytic explanations of and measures for prevention of this too frequent tragedy. An enlarged section on the favorable aspects of the prognosis in schizophrenia is fortunately presented. The chapter on "Applications" has been expanded and now includes sections on Education, Industry, Religion, Law and Medicine, the latter two of which should be outstandingly illuminating to the average reader. The treatment of the subjects of personality types and mental mechanisms continues to be the outstanding nontechnical explanation of these subjects so difficult of comprehension by the layman.

So again, the almost universal opinion that this book can be unreservedly recommended to any interested in the modern thought and history encompassed in the broad term psychiatry, can be repeated. Further than this, Menninger has reason to believe and so states in his preface, that it may be a contribution to that frowned upon field of therapy, namely bibliotherapy. If such is the case, it is entirely possible that this volume may be the means of applying the knowledge and principles of present-day psychiatry to many more people than can be reached by hospitals, clinics, or lectures.

Man Against Himself. By KARL A. MENNINGER, M. D. Harcourt, Brace and Company, New York, 1938. 485 pages, with index. Price $3.75.

It would indeed appear, from a thorough reading of Menninger's work, that man is his own worst enemy. One encounters an almost endless store of ingenious devices by which the psychobiological entity which is the human personality, under stress seeks to achieve its own destruction. Included in these devices are mechanisms which, not totally destroying the personality, yet manage to cripple it and to defy efforts at reconstruction.

Reduced (on page 81) to its lowest common denomination, the underlying theme is: (1) "that the destructiveness in the world cannot all be ascribed to fate and the forces of nature, but must be in part laid at the door of man himself," and (2) "that the destructiveness of mankind appears to include a large amount of self-destructiveness, in paradoxical contradiction to the axiom that self-preservation is the first law of life."

The phenomena of asceticism and martyrdom are listed under the heading of "chronic suicide"—that sweet torture of deprivation which is in essence either a "living death" or "dying over and over, at intervals." Ascetics and martyrs are of course not limited to ecclesiastic legend, but are to be found in all walks of life; Menninger's examples are well chosen.

Other forms of self-destruction are neurotic invalidism, alcohol addiction and antisocial behavior. Psychosis, with its rejection of reality, is quite understandable as a self-destructive mechanism.

In the section on "Organic Suicide" the author waxes philosophical, but his hypotheses are well founded in psychopathological principles. He says "Each man has his own way of destroying himself; some (ways) are more expedient than others, some more consciously deliberate . . . Perhaps organic disease is one way." This would carry out to the last iota the psychobiological view of the individual: absolute interdependence of psyche and soma. Here also, Menninger states ". . . theoretically this remains the task and the opportunity of psychoanalysis, viz., to identify and relate specifically the emotional factors contributing to somatic disease."

The discussions of focal suicide covers the devices of self-mutilation, malingering, polysurgery, purposive accidents, and impotence and frigidity. A section on reconstruction offers two classes of techniques: clinical and social. Objectives to be envisioned in the former are: diminution of the aggressive element (perhaps too vain a hope), diminution of the self-punitive element (more amenable to correction, it would seem), and enhancement of the erotic element (an appeal for "bigger and better" sublimations—reviewer's quotes). Social techniques provide still more perplexing problems, chiefly, as the author points out, owing to the cross-purposes of psychiatrists and sociologists: the old problem of whether the individual molds the group, or the group, the individual.

Decidedly well written, Man Against Himself is addressed to the general reading public as well as to workers in the several phases of mental hygiene. The illustrations are mixed, some derived from clinical observations, others being clipped from current popular periodicals. The book is far from dull, provokes thought, and introduces some relatively new concepts. It is a distinct contribution to the general literature of human relations.

The 1937 Yearbook of Neurology, Psychiatry and Endocrinology. By REESE, PASKIND, SEVRINGHAUS. Yearbook Publishers, Inc., Chicago. 767 pages. Price $3.00.

This review of psychiatry and related topics is fully up to the average

of those of previous years. About 150 pages are devoted to psychiatry. There is an interesting review of the literature appearing during the year on the subject of hypoglycemia, which includes papers published as late as October 30, covering reports from foreign countries, particularly those of Western Europe. It appears that there is much yet to be done in establishing standards by which recovery may be gauged. The absence of such guides possibly accounts for the varying results obtained in the administration of insulin, as reported in the papers quoted. There seems to be very general agreement that the best results are obtained within twelve or eighteen months from the onset of the symptoms.

Other subjects covered are electroencephalograms and numerous studies on blood chemistry and the treatment of oxygen and other deficiencies. Dr. Malzberg's paper on "Mortality Rate in Involution Melancholia," is summarized; also the paper on "Psychic Phenomena Associated with Cardiac Failure," by Dr. N. D. C. Lewis. It is apparent that the treatment of psychoses has received impetus in recent years. Much of it appears to be entirely experimental but the more hopeful attitude on the part of physicians is noteworthy.

Psychiatric Nursing. WILLIAM S. SADLER, M. D., in collaboration with LENA K. SADLER and ANNA B. KELLOGG, R. N. C. V. Mosby Company, St. Louis, 1937. 396 pages, plus glossary and index. Price $2.75.

The comprehensive nature of this text at first stimulates the reviewer to praise, then to adverse criticism. Unfortunately, the latter outweighs the former, for reasons which will be reserved for the later portion of this review.

Let us first utter paeans for the inclusive nature of the work from the psychopathological standpoint. The book provides the nurse with an introduction to psychiatric disorders which, if it does not challenge her absorptive faculties, will give her an over-all view of the clinical entities presented in the mental hospital. An easy, readable style characterizes the writing, but here, indeed, is the rub—in "writing down" to the uninitiated, how many crimes are committed in the name of simplicity! It is all too generally the case that when simplicity comes in the door, accuracy flies out the window. Herein lies a grievous fault of the work under review.

The authors offer a classification of causation. In it are some duplications, some inconsistencies and generally a rather obvious attempt at ingenuity. "'Age" is listed as a causative factor; but "physiologic epochs" are likewise listed. Now, age *per se,* is merely a mathematical expression,

a "yardstick." The individual's age does not cause a neurosis or a psychosis, although various channels of development at more or less distinct year levels are known to be causative factors. Let us, then, abandon the generalization of "age" and specify these developmental agencies: physiological, psychosexual, environmental, and others.

"Modern civilization" as a cause (the authors echo a common cry) is a further generalization, and might have been included under "economic life" or some other classification, if it had to be included at all. The brief, but emphatic mention of heredity is misleading and injures the reliability of the presentation. We are also told that the savage does not develop neuroses because "he has not been taught to *concentrate his mind*"—authors' italics. Here is "writing down" with abandon.

In the use of the word "insane" (and its derivatives) Sadler takes a backward step, even to a *reductio ad absurdum* in his classification of mental and nervous disorders, where he lists: "The Psychoses—*The Insanities*" (our italics, this time). The authors belie modern psychiatric thought in their discussion of well-adjusted adolescents, when they say: ". . . these youths, having well-balanced nervous systems, are able to effect a satisfactory adjustment of their personality difficulties." Thus we must cast overboard our psychogenic considerations—give us all well-balanced nervous systems and maladjustment will vanish from the clinic.

The above inconsistencies are only selections; many others have been underlined in the review copy. A perusal of the complete text convinces one that it is to be recommended only for partial reference. It is lean in practicability; towards the end of the work, as if it were an after-thought, comes a short section on therapeutic measures.

The glossary is acceptable, but definitions therein have a strange ring of familiarity; comparison with a work devoted to this purpose alone reveals a profusion of word-for-word duplications. If authors cannot refer their readers to these other dictionaries and wordbooks, they might at least indicate the source of their definitions.

Nervous and Mental Diseases for Nurses. By IRVING J. SANDS, M. D. 3rd edition. W. B. Saunders Company. Philadelphia and London, 1937. 308 pages, supplementary reading references and index.

The third edition of Dr. Sands' book presents to the reader much practical knowledge of nervous and mental diseases in a concise manner. Additional references for supplementary reading are included. The chapter on endocrinology has been entirely rewritten to conform with present-day knowledge. The psychoses have been revised to bring them into harmony

with the latest classification and nomenclature. Epilepsy and its allied disorders have been rewritten to include the discoveries made in the field of convulsive states. The modern methods of management of skull and spinal injuries are outlined. Forced spinal fluid drainage, immunization against poliomyelitis, insulin treatment of schizophrenia, and the newer methods of treatment of the myopathies are among the additions made to the book.

A few minor corrections are offered; on page 23, the twenty-third line, the third person plural should be used instead of the singular; namely *consist* instead of *consists;* page 54, eighth line, *luteum* in place of *lutein;* on page 196 under the heading of "nursing" mention should be made of the necessity to watch for failure to void and distention of the bladder in pareties and other neurosyphilities undergoing malarial therapy. Finally, more enthusiasm could be voiced for insulin therapy as indicated by statistics which are now being published in the various medical journals.

In spite of the fact that this book, like all others that attempt to deal with a lengthy subject in a concise manner, in places almost does injustice to the subject matter (e. g., the chapter on neuroanatomy), it has many good points and fills a great need in the literature on nervous and mental diseases for nurses. The chapter which deals with special nursing procedures in the common neurological disorders is unusually practical; the treatment of mental hygiene by Dr. Sands will give the reader much useful knowledge which can be used in everyday life and work. The chapters on the development of modern psychiatry and psychoanalysis give the reader a psychiatric background which is indispensable to those interested in psychiatry.

Primarily this interesting book is meant for the nurse but it could be read with profit by any person interested in neuropsychiatry. Dr. Sands' contribution to the science of nursing is a very definite one and every nurses' training school should recommend it to its students and alumnae.

Sleep Characteristics. By N. KLEITMAN, F. J. MULLEN, N. R. COOPERMAN, and S. TITELBAUM. The University of Chicago Press, Chicago. 87 pages and index. Price $1.00.

This little volume contains the results of an experimental study on sleep and on the factors that influence it. Five criteria are chosen to determine the quality of sleep, and they are studied under normal and various experimental conditions. The criteria are: Going to sleep with ease; motility during sleep; uninterruptedness of sleep; duration of sleep; dreaming and subjective feeling of well-being upon awakening.

The observations were made on a mixed group of 36 individuals over an average period of 179 nights. The technicalities of the method are outlined in detail. Some of the problems studied are:

Barometric pressure and temperature
Daytime activity and time of retiring
General physical health and emotional situation
Various "prescribed conditions" such as administration of hypnotics and intake of nourishment prior to retiring.

The authors feel (preconceivedly?) that 14 gms. of Ovaltine taken before retiring have a beneficial effect on some of the sleep characteristics, particularly on the subjective feeling of well-being, upon awakening. The volume ends with a brief discussion and a summary of the results, arranged in 20 tables. Many insignificant findings are reported in great detail; by omiting them, much could have been done to clarify and stress the more important points. The percentage recording of most results is statistically unconvincing, owing to the small number of cases studied; the authors have used these percentages as bases for unjustified conclusions. Further observations, on larger numbers of subjects, appear to be indicated, before definite criteria for the variation of sleep characteristics can be established.

There is very little to be found in this book that will interest the psychiatrist. It may, however, be mildly stimulating to the physiologist.

Alcohol. One Man's Meat. By EDWARD A. STRECKER, M. D., Sc.D., and FRANCIS R. CHAMBERS, Jr. The Macmillan Company, New York, 1938. 230 pages. Price $2.50.

In the lore of the subjects of this work there is a chant "Another little drink won't do us any harm." One is prompted to say also, that another book on alcoholism cannot harm the advancement of public understanding of the psychiatric approach to alcohol addiction. Two such books reviewed in as many issues may presage an avalanche of volumes whose authors will seek "to understand the problem drinker." It remains to be seen what sort of stuff we shall get when the vogue is in full swing. At present, however, the quality of the work is highly creditable.

The work of Strecker and Chambers is of a different nature from that of Durfee's "To Drink or Not to Drink." Written more in the vein of the textbook, it is nevertheless personal enough in its style to invite thorough reading by the uninitiated. The material is resolved into two general considerations, Part I bearing the title The Psychology of Alcoholism, Part II, The Treatment of Alcoholism.

The correction of popular misconceptions offers a sizable task for any author. The present writers do their bit in this direction, and are to be commended. The physiological action of alcohol is described and the lay reader instructed in the knowledge that alcohol has long masqueraded as a stimulant, while it is really a narcotic at every stage of its influence on the central nervous system. Further, as has been demonstrated and written about by others, readers are admonished against the too inclusive use of the word "alcoholism." Psychiatrically speaking, there is no such thing as a disease entity of alcoholism. It is once more a question of cause and effect. These authors, like others, insist that drinking is an avenue of expression for unconscious cravings, no matter how the individual may adorn the habit with rationalizations on a social or "business" basis.

On the strictly psychoanalytical side, one encounters a description of the drama of drunkenness which is worthy of citation:

> The individual is enacting the alcoholic drama of escaping the burdens of maturity and he may be observed retreating step by step to childish levels of mentality.
>
> When a certain drunken level is reached, he begins to simulate the reactions of a several months old infant. One could almost judge the point at which the individual rebelled at growing up emotionally by the degree to which he habitually allows himself to become intoxicated . . . Most individuals seem satisfied in regress to some phase of the "teen" age . . . Others seem satisfied with a very slight descent, and still others are never satisfied until they have reached an infantile level . . .
>
> . . . If we accept the hypothesis that the results arrived at by drinking are progressively regressive, then the incentive that causes one to drink is prompted by the unconscious desire to regress . . . Even the most moderate users are in search of a fractional amount of release from the surveillance of their mature, self-critical faculties.

The hypothesis *is* accepted in many circles, and should not only be more widely accepted, but more honestly reckoned with by "problem drinkers."

On page 42 we are told "In our experience, at least 90 per cent of all abnormal drinkers are predominantly of the introverted type." Could this not be an exaggeration? Certainly the rather general drinking seen at (e. g.) a convention of salesmen, or at some fraternal lodges is done by some of our most representative extraverts. Incidentally, the spelling "extrovert" annoyed the reviewer every time it appeared—and its use was fre-

quent. Strecker and Chambers seem to have become snarled in this introvert-extravert problem, especially when, a few pages later, they try to explain why the extravert drinks. ". . . to introvert himself?" This leaves us in a worse fix than in the beginning. The authors answer the question vaguely, with a sort of Yes and No solution. In challenging their 90 per cent figure, however, the reviewer understands that their conclusion was reached from observation of their own clinical or practice material.

The psychological approach presented by the writers is said to be from three dimensions: escaping reality, introversion and the psychoneurotic nucleus. Explaining the last named, they elaborate on the "alcoholic compromise," in which the psychoneurotic who has been groping about for an avenue of escape from the taunts of his superego, in desperation sneaks down the back alley of alcohol addiction. This, they say, he does without conscious deliberation; rather, it creeps up on him. The way is easy, for on the surface the sufferer can offer innumerable rationalizations which "do not require complicated psychological mechanisms." He can say with reasonable hope of being believed, that he drinks "to be sociable," "to get that big order," "to get a kick."

One point is not clear. Despite a general reference to psychoanalytical principles, the authors display moods of partial rejection of this discipline. Witness, in the interpretation of an "alcoholic dream," on page 98:

> We realize that certain psychoanalytical schools might interpret this dream as an unconscious wish for self-destruction . . . In this instance we uncovered nothing to signify that this was the case, and we are inclined to accept a theory that in alcoholic addiction an unconscious, peculiarly alcoholic conflict exists.

Later, in Chapter VI, they put up a strong objection to sexual interpretations of the drives underlying alcoholic abuse. Two quotations are given, however, to show the vacillation that prevails in this part of the book:

P. 106:

> We are inclined to believe that inferiority reactions, that are certainly not dominantly sexual and even more importantly, a pattern of parental spoiling and overdominance during childhood, leading to the development of emotional immaturity, not dominantly sexual, are closer to the cause of alcoholism.

If a more scrambled sentence is ever written, it will require a fiendish ingenuity. The above is reproduced, punctuation and all, exactly as in the original, and if the breath can be held long enough, the sentence can be

read aloud. But at the end, what have we? A denial of what follows on page 107:

> Of necessity, the sex impulse must play a large, though often indirect role in the psychology of excessive drinking.

Now, if the role is large, indirect as it may be in the bargain, it must be *a* dominant force—if not *the* dominant force. This chapter was particularly disappointing because of the cat-and-mouse game the authors played with Freudian concepts.

Part II is better founded, as one would expect it to be. The authors show new ways to replace worn-out approaches to cure, or alleviation. Some salient points are herewith quoted:

> (The patient) is quick and unerring in sensing a defeatist attitude on the part of the therapist, and at once turns it into an argument for prolonging his addiction . . .
>
> Rapport on a mature plane takes the place of persuasion . . .
>
> Alcohol is no respecter of persons . . . rigidly set and formalized reeducational schemes are foredoomed to failure.

Chapter X, entitled Treatment, introduces the following sections:

> The First Interview.
> The Patient Learns Why He Wants to Get Well.
> Establishing a Psychologically Curative Conditioned Reflex.
> Relaxation Is an Important Treatment Factor.
> Consultations Should Be Frequent (Chapter XI).
> Vocational Adjustment (Chapter XI).

In general the book is acceptable. It should do a lot of good. It should set many readers in the right paths for understanding that alcoholism is not a cause, but an effect. Perhaps the outstanding remark in this respect is:

> . . . alcoholism needs another Pinel to free it from its chains. In a sense, alcoholics are still too often as badly treated as were the insane hundreds of years ago, when their symptoms were thought to be due to demoniacal possession . . . Ignorant and clumsy methods too often destroy the very potential in the alcoholic that might have been accessible had his problem been understood as a problem in abnormal psychology.

A FURTHER NOTE ON EUGENIC STERILIZATION

At the meeting of the American Association on Mental Deficiency held in Richmond, Va., in March, 1938, an interesting paper was read by Dr. G. B. Arnold, superintendent of the State Colony for Epilepties and Feebleminded, entitled "A Brief Report of the First Thousand Patients Eugenically Sterilized at the State Colony for Epilepties and Feebleminded." The operation was authorized to be performed upon inmates of the State Colony and the four state hospitals of Virginia by an act passed by the general assembly in 1924. Great pains were taken to test the legality of this act and it was carried up through the courts of Virginia to the Supreme Court of the United States, where on May 2, 1927, in an opinion prepared by Mr. Justice Holmes, the act was fully upheld. Since that time the operation has been performed on 609 women and 391 men. The theory upon which it is done is the assumption that epilepsy and feeblemindedness are due to hereditary causes, but apparently in only 50 per cent of the cases was "definitely bad family history established." It will be interesting to watch the future developments resulting from this law in the state of Virginia and a similar law in operation for a longer period in the state of California. The operation of sterilization should not be regarded as ending the case record. The medical profession and the public will want to know what happens to these one thousand individuals—whether they have by this means been prepared for better citizenship and more useful lives. The institutions of Virginia have an opportunity, too, for making a worthwhile contribution. Their method of dealing with mental disease and defect is on trial. A radical step has been taken. The public is entitled to know whether the sanguine hopes of its proponents of reducing the incidence of feeblemindedness in the general population is rally to be accomplished. Thorough social service work should be undertaken to follow the careers of the 700 who have been discharged from the institution, with satisfactory placements in their own homes or in foster homes, to determine the subsequent careers of the patients who are returned to family life.

NOTES

—Jacob Oshlag, former manager of the Manhattan State Hospital, died May 18, 1938. An authority on cardiac disorders, Dr. Oshlag was the author of a 2 500-word article on the anatomy and function of the heart, for the Encyclopedia Americana. He was for 20 years a member of the Board of Visitors of the Manhattan State Hospital and had also been consultant to the Central Islip State Hospital.

—A special session of the Kentucky legislature was called late in May, to consider a bill relating to the Division of Hospitals and Mental Hygiene. The bill provides for modern methods of treating mental disorders and also would introduce a system of mental hygiene as a public health service.

This commendable move was prompted by the report of the Mental Hospital Survey Committee following a study made last summer and fall at the request of Governor Chandler. Problems of overcrowding, insufficient medical service and fire hazard appeared the most pressing. Numerous reforms were found necessary, and it is to the credit of the State of Kentucky and Governor Chandler, that the opportunity is being seized to institute adequate, humane treatment of the mentally disordered.

One reads also, with gratification, that facilities are being expanded, at the University of Louisville, for instruction and clinical work in psychiatry.

—The annual meeting of the American Psychiatric Association was held in San Francisco, from June 6 to 12. Among other creditable papers that were read, a large number of studies on hypoglycemic shock treatment of schizophrenia were presented. Officers who assumed their duties for the coming year were: Dr. Richard H. Hutchings, Utica, N. Y., president; Dr. William C. Sandy, Harrisburg, Pa., president-elect; Dr. Arthur H. Ruggles, Providence, R. I., secretary-treasurer.